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BRITISH MUSEUM
NATURAL HISTORY

TUTE SI RECTE VIXERIS

PHILOSOPHICAL TRANSACTIONS.

Giving ſome
ACCOUNT
OF THE
Preſent Undertakings, Studies and Labours
OF THE
INGENIOUS,
IN MANY
Conſiderable Parts of the World.

VOL. XXIV. For the Years 1704 and 1705.

LONDON:

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Church-yard. MDCCVI.

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BRITISH MUSEUM
NATURAL HISTORY

TO HIS
ROYAL HIGHNESS,
THE
PRINCE,
This Twenty Fourth
Volume of *Philoſophical Tranſactions*
is Moſt Humbly Dedicated,

BY

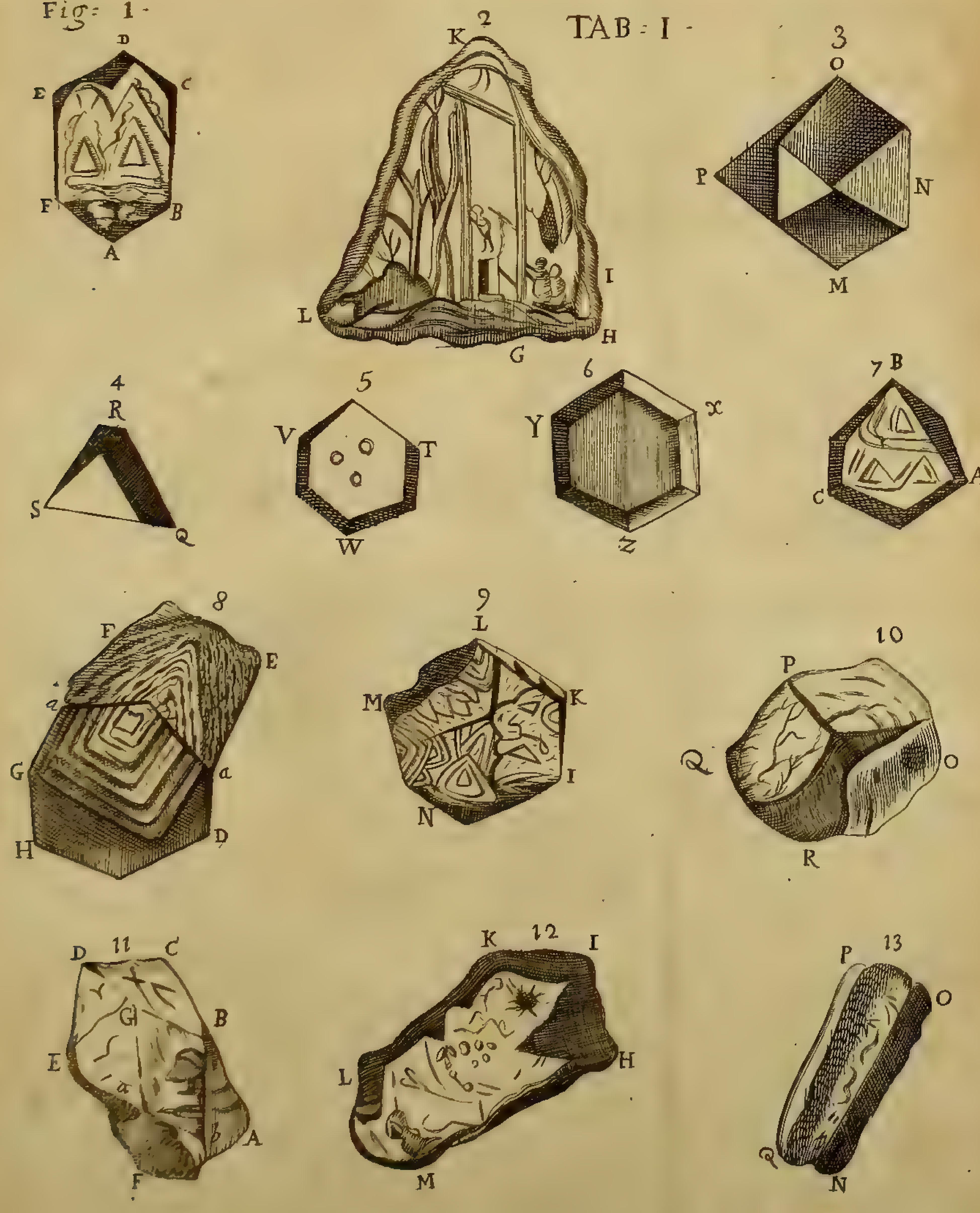
His Moſt Dutiful
AND
Moſt Obedient Servant,

HANS SLOANE,

Soc. Reg. Secret.

BRITISH MUSEUM NATURAL HISTORY

TAB: I



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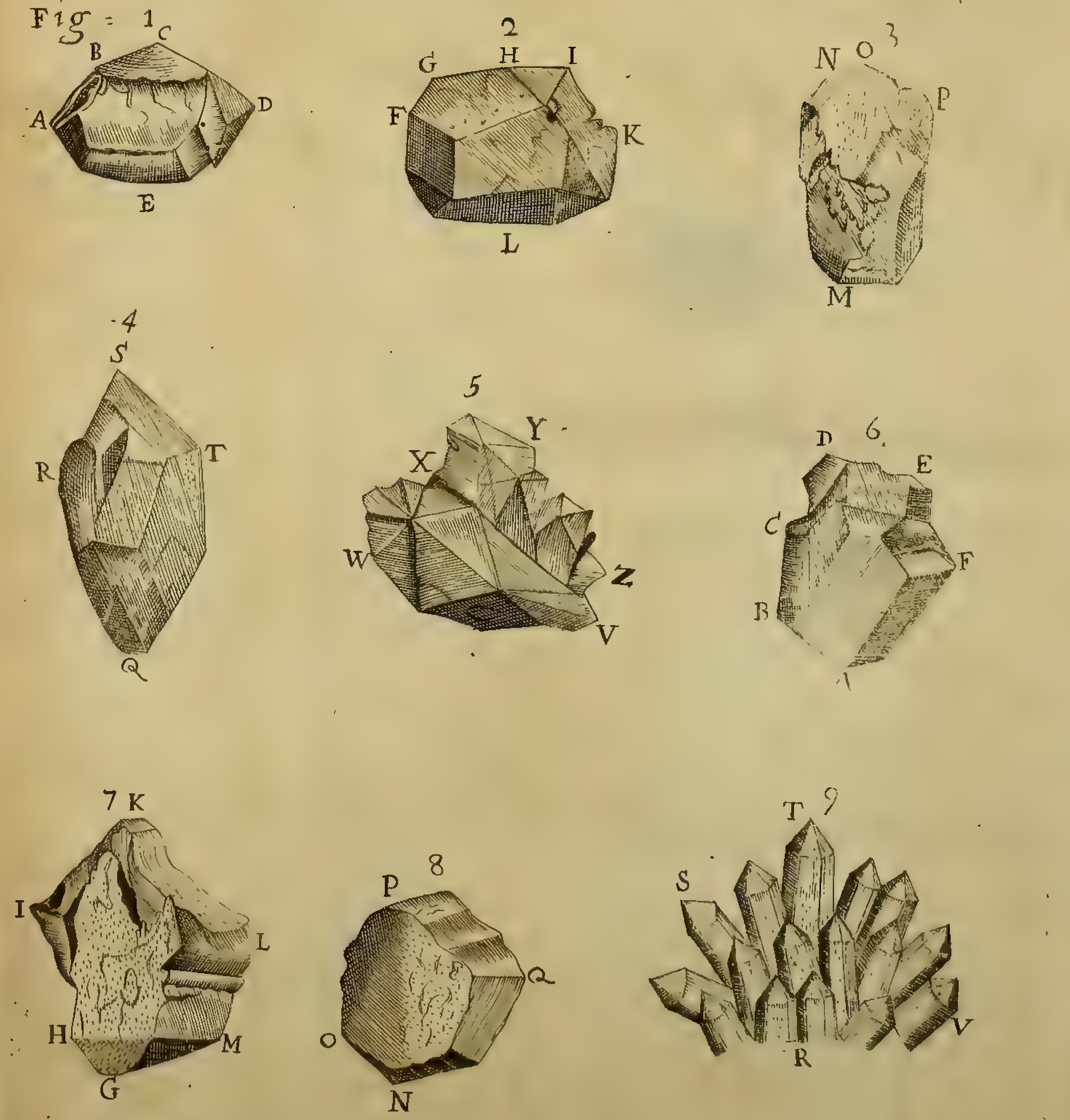

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PHILOSOPHICAL TRANSACTIONS.

For the Months of January *and* February, 1704.

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I. *Part of a Letter from Mr* Anthony van Leuwenhoek, *concerning Worms obſerv'd in Sheeps Livers and Paſture Grounds.* Delf, Nov. 3. 1703.

THis ſerves to communicate to you my ſlender Obſervations concerning the *Animalcula* that are almoſt always found in Waters, and alſo ſometimes upon Land.

In the Summer of the Year 1702. we had not Rain enough to cover even the loweſt parts of the Meadows adjacent to our City; inſomuch, that none of the Sheep of that year drank of the Waters that uſed to ſtagnate on the ſaid Meadows, which when it happens (according to the opinion of our Butchers) produces a certain ſort of Worms called *Bottiens* in their Livers, whereof we have formerly ſpoken more than once. Notwithſtanding which, I was informed that ſome of the Sheep of thoſe Paſtures had their Livers infected with ſuch like Worms; this made me conjecture that the above-mentioned Diſtemper in the Livers of the Sheep muſt proceed from ſome other cauſe than their drinking the ſaid Waters.

I cauſed a Butcher therefore, who was Owner of one of theſe Meadows (and who had alſo informed me that the Sheep which he turned into that Ground were mightily peſter'd with Worms in their Livers) to cut me two pieces of Greenſod from thence, to the end I might try whether I could find any ſuch Worms in them.

This Land he told me was ſo high, that it was never wholly under Water in Winter time, but the Ditches about it were ſo full, that they were in a manner level with the Land, and ſome of the lowermoſt parts of the ſame, when it rained much, were a ſhort time covered.

I narrowly ſifted thoſe two pieces of the Earth, but could find no *Animalcula* in them that any way reſembl'd the Worms in the Sheeps Livers.

From hence I infer, that the *Animalcula* that are found not only in Sheeps but in Cows Livers too, muſt not be ſought for in thoſe Waters that ſtagnate upon the Land, (as I formerly thought, and the Butchers alſo are of the ſame opinion) but that we muſt ſeek them in the Land it ſelf; which being throughly wet or ſoakt, they aſcend to the ſuperficies of it, becauſe the common Water being not natural to them, they cannot live in it; and thus lurking in the Graſs they are ſwallowed by the Cows and Sheep, and ſuch as eſcape their Teeth are conveyed into their Stomachs and Bowels, and inſinuate themſelves even into the Liver.

I have been often told that the Cattel which feeds in *Siltagtig* Grounds are free from this Diſeaſe of Worms, but being informed that the ſaid kind of Ground is very low, and lies under Water the moſt part of the Winter, I gave the Butcher theſe Reaſons:

Why Kine and Sheep that feed in high Clay grounds are troubled with Worms in their Livers, and thoſe in low Grounds are free, is, only becauſe the low Grounds lie all the Winter under Water; for tho ſuch like Worms may be found in ſome of the low Lands, yet as ſoon as they are overwhelm'd with Water, thoſe Worms, abhorring the Water, die immediately.

To confirm my reaſoning, I took a Glaſs Tube, which at the upper end was about an Inch wide, and above a Foot in length, I put into it a little piece of the above-mentioned Earth near 5 Inches long, but ſo narrow, and the Graſs about it clipt ſo cloſe, that it would eaſily go into the Tube without preſſing, and then poured upon it boil'd Water, which had ſtood till it was cold.

Preſently after I perceiv'd that ſeveral very ſmall and long white Worms came out of the Earth, which reaching and incurvating their bodies, ſubſided leiſurely to the bottom of the Tube, none of them being able to emerge to the ſuperficies, whence I concluded that they could not live in the Water; and in effect, after they had lain 24 hours in the bottom of the Glaſs, I found they were all dead.

It ſeem'd to me alſo that theſe white Worms conſiſted of ſeveral ſizes or magnitudes, and that they could not be the Offſpring of our common Worms, becauſe they were much longer, in proportion to their bigneſs.

I ſaw likewiſe a common Worm creeping out of the aboveſaid Earth, which leiſurely ſubſided and remained at the bottom of the Tube with little or no motion, and the next day it was dead.

As for thoſe ſmall *Animalcula* that came out of the Earth, and ſwam about the Water, they were of ſo many ſeveral ſorts and ſizes, that the deſcription of them would take up too much room, beſides ſome of theſe *Animalcula* were ſo exceeding ſmall, that I could not perceive what figure they were of, tho I viewed them very nicely and very frequently, nay, tho I ſhifted the Earth and Water three times.

Now that theſe *Animalcula* may be call'd Water-worms, tho they are found in the dryeſt part of the Earth, appears from their living ſo well in the Tube filled with Water, in which, tho I obſerv'd them day after day, I found no difference in them, ſave that they were encreaſt in number, and beſides I have met with ſeveral of them in common Water.

In theſe Obſervations I diſcovered a few particles of Sand mixt with Clay, the ſides of which appear'd as if they had been broken or grated off from Stones, and ſome of them were ſo very ſmall, that above a thouſand of them together did not exceed the magnitude of a ſingle grain of common Sand that is us'd in Scowring, *&c.*

I went another time into one of the Meadows near our Town, it conſiſted of a good Clay Earth, and was as high as any of thoſe about us; I dug out a little bit of the ſaid Earth, about the bigneſs of a Crown piece, which was covered with Clover-graſs, ſhort and fine; I imagined I ſhould find in the top of it ſome living Creatures, becauſe I had formerly found in the rotten wood of a Willow Tree, and in another rotten Plank that had lain in the open Air, ſome of thoſe *Animalcula* which are uſually found in the Water.

When I came home I clipt away the Graſs from the Earth or Clay, and put the top of it in a clean Glaſs Tube about as big as a Childs Finger, and pour'd upon it boil'd Rain Water after it was cold, and having ſhaken that Earth and Water well together, the Water was ſo thick and troubl'd, that I could perceive none of the *Animalcula* therein, tho there were a great many in it.

But after the ſaid Water had ſtood about half an hour in the Tube, I could perceive ſeveral *Animalcula* creeping up the ſides of it, and others ſwimming about the Water.

This Water having ſtood ſeveral hours, and acquired a little more clearneſs, I ſaw two particular *Animalcula* that came very near in Figure to thoſe that produce *little Wheels* out of their Bodies, only inſtead of ſuch *Wheels* they protruded a Horny part out of their Body, which they ſometimes drew in, and then thruſt out again; there was alſo one *Animalculum* that put out *two Wheels*, and juſt by I perceived two other ſorts of *Animalcula*, but immediately loſt ſight of them again; from whence I concluded, that ſo much Water was not natural to them, and therefore they were dead; and after that the Water had ſtood three days upon the Clay, I ſaw ſeveral *Animalcula* that were four times as long and as thick clinging to the ſides of the Glaſs without any motion, tho they ſtirred about briskly at the firſt.

I took another Glaſs Tube, and put into it a little of the ſame Earth which I handled very tenderly, pouring upon it ſome of the boiled Water as before without ſhaking it at all, that the *Animalcula* might emerge the better, and after an hours time I ſaw above twenty *Animalcula* ſwimming, whereas in the firſt I could perceive none; and one of them thruſt Wheels out of his Body.

Now it will appear ſtrange to ſome, that theſe *Animalcula*, which uſually and naturally ſwim in the Water, ſhould be found in Earth that has not been moiſten'd by Rain or otherwiſe in ſeveral weeks; but they muſt be informed, as I have often found by experience, that ſeveral ſorts of very ſmall *Animalcula* are to be met with in Rain water, and eſpecially in the Gutters on the tops of Houſes; for I have taken ſome of the ſlime or dirt of thoſe Gutters after they have been dry above a year, and diluted the ſame in boiled Water after it was cold, whereupon I ſaw ſeveral *Animalcula* ſwimming, and ſome of them being up folded almoſt in a Globular Figure, extended their Body leiſurely, and then ſwam about the Water.

If it be objected, how comes it to paſs that theſe *Animaicula* that are meerly aquatil ſhould be found on the Land ſeveral rods diſtant from any Ditch; I anſwer, I conceive this to happen after the following manner.

We have often found in a Storm, that the Water has been ſo furiouſly driven againſt the ſides of the Ditches, and the parts of ſuch Water ſo minutely divided, that not only ſeveral of its ſmaller Particles have been carried a great way into the Land by the ſtrong Wind, but ſome of them alſo thruſt up, or attracted even into the Clouds; and I am confirmed in this opinion by the following inſtance: I ſtood one time to obſerve with what force, and how great a diſtance a Bleecher caſt Water with his Scoop out of a Ditch upon his Linnen that was ſpread over the Meadow, whereby many of the parts of the Water were ſo divided, that they never fell to the Earth, but were exhaled up into the Clouds.

In the ſaid ſmall Particles of Water are conveyed the above-mentioned ſmall *Animalcula* far up into the Land, and when the Ground becomes dry, they contract themſelves into an oval Figure, and the Pores of their Skin are ſo well cloſ'd, that they do not perſpire at all, whereby they preſerve themſelves till it Rains, upon which they open their Bodies and enjoy the moiſture. And thus, in my poor opinion, it happens that we find theſe *Animalcula* in every Meadow of our Country, none of which are very remote from the Sea or Water Canals.

II. Solutio Problematis.

A Clariſſ. viro D. Jo. Bernoulli in Diario Gallico Febr. 1403. Propoſiti.

Quam D. G. Cheynæo communicavit Jo. Craig.

P*Roblema.* Propoſitæ Curvæ Geometricæ alias innumeras Longitudine Æquales invenire.

Solutio. Sint w, s, co-ordinatæ Curvæ datæ ; & Curvæ quæſitæ ſint co-ordinatæ x, y : tum ex conditione Problematis erit $dw^2 + ds^2 = dx^2 + dy^2$. Ponatur $dx = dw - m\,dz$, unde erit $dy = \sqrt{ds^2 + 2m\,dw\,dz - m^2\,dz^2}$; in hac pro ds ſubſtituatur ejus valor per w, dw & determinatas expreſſus : & pro dz aſſumatur talis valor ex w, dw & determinatis compoſitus, ut valores quantitatum dx, dy ſint ſummabiles : Et ſic habentur x ac y Co-ordinatæ Curvæ quæſitæ. Q. E. J.

Exemplum 1. Invenire Curvam æqualem Lineæ Parabolicæ. Sit $2a$ latus rectum Parabolæ ; adeoq; $2as$

$ds = w^2$ unde $ds^2 = a^{-2} w^2 dw^2$ adeoque $dy = \sqrt{a^{-2} w^2 dw^2 + 2m\,dw\,dz - m^2 dz^2}$; ut hæc ſit ſummabilis aſſumatur $m\,dz = \frac{w^2 dw}{a^2}$: unde $dx = dw - a^{-2} w^2 dw$: $dy = dw\sqrt{3a^{-2} w^2 - a^{-4} w^4}$ quarum integrales per Methodos dudùm cognitas invenientur $x = w - \frac{w^3}{3a^2}$ $y = \frac{w^2 - 3a^2}{3a^2}\sqrt{3a^2 - w^2}$.

Exemp. 2. Invenire Curvam æqualem Circulari. Sit a radius Circuli; tum $s = \sqrt{a^2 - w^2}$; unde $ds^2 = \frac{w^2 dw^2}{a^2 - w^2}$; & proinde erit $dy = \sqrt{\frac{w^2 dw^2}{a^2 - w^2} + 2m\,dw\,dz - m^2 dz^2}$; ut hæc ſit ſummabilis, aſſumatur $m\,dz = \frac{4w^2 dw}{a^2}$, adeoq; $dx = dw - \frac{4w^2 dw}{a^2}$: $dy = \frac{-3a^2 w + 4w^3}{a^2\sqrt{a^2 - w^2}}dw$. Quarum integrales per communes Methodos inveniuntur $x = w - \frac{4w^3}{3a^2}$, $y = \frac{a^2 - 4w^2}{3a^2}\sqrt{a^2 w^2}$:

Exemp. 3. Invenire Curvam æqualem Ellipticæ. Sit $2r$ latus rectum, $2a$ latus tranſverſum, tum $s = \frac{r\sqrt{a^2 - w^2}}{a}$, unde erit $ds^2 = \frac{r^2 w^2 dw^2}{a^4 a^2 w^2}$, adeoque $dy = \sqrt{\frac{r^2 w^2 dw^2}{a^4 - a^2 w^2} + 2m\,dw\,dz - m^2 dz^2}$; ut hæc ſit ſummabilis aſſumatur $m\,dz = \frac{2a + 2r}{a^3} w^2 dw$: unde $dx = dw - \frac{2a - 2r}{a^3} w^2 dw$. $dy = dw\sqrt{\frac{r^2 w^2}{a^4 - a^2 w^2} + \frac{4a + 4r}{a^3} w^2 + \frac{2a + 2r|^2}{-a^6} w^4}$; quarum Inretegrales per Methodos notiſſimas inveniuntur $x = w - \frac{2a - 2r}{3a^3} w^3$. $y = \frac{2a^3 - ra^2 - 2aw^2 - 2rw^2}{3a^2} \sqrt{a^2 - w^2}$.

Exemp. 4. Invenire Curvam æqualem Parabolæ Cubicali cujus æquatio ſit $3a^2 s = w^3$. Unde $ds^2 = \frac{w^4 dw^2}{a^2}$ & proinde $dy = \sqrt{a^{-4} w^4 dw^2 + 2m\,dw\,dz - m^2 dz^2}$; Ut hæc ſit ſummabilis aſſumatur $m\,dz = \frac{w^2 dw.}{2a^2}$ Unde $dx = dw - \frac{w^2 dw}{2a^2} \sqrt{3w^2 + 4a^2}$. Quarum integrales per Methodos vulgo notas ſunt $x = w - \frac{w^3}{6a^2}$, $y = \frac{2}{9} + \overline{3w_2 + 4a^2}$.

Ex aliis infinitis valoribus quantitatis $m\,dz$ debitè aſſumptis infinitas invenias Curvas datæ æquales. Tu verò, *vir Eruditiſſime*, facilè percipias hoc Problema aliquam habere cum Problemate quodam Diophantæo affinitatem: Problema Diophanti eſt, dividere ſummam duorum Quadratorum in duo alia quadrata, quorum latera ſint rationalia; & Problema *Bernoullii* eſt, dividere ſummam duorum Quadratorum in alia duo Quradrata, quorum latera ſint ſummabilia. Sicut Problematis *Diophantæi* ſolutio a vulgari tantùm Algebrâ dependet, ſic *Bernoullkiani* Problematis ſolutio communes tantùm Fluxionum Methodos inverſas requirit: utriuſq; artefecium in debitâ laterum quæſitorum aſſumptione conſiſtit; ſcil. *Diophantæum* ut ſint rationalia, *Bernoullianum* ut ſint ſummabilia.

III. *Part of a Letter from* John Fuller *of* Suſſex, *Eſq; concerning a ſtrange effect of the late great Storm in that County.*

December 6. 1703.

WE live Ten Miles off the Sea in a direct line, and yet can ſcarce perſwade the Country People, but that the Sea water was blown thus far, or that during the Tempeſt the Rain was ſalt, for all the Twiggs of the Trees the day after were white, and taſted very ſalt, as I am informed almoſt by every body, tho I did not taſte them time enough my ſelf, nor obſerve it, and that not only upon this Hill where we live facing the Sea, but in all other places within 14 or 15 miles of the Sea, as well in the Valleys, between which and the Sea are ſeveral very high Hills, as on the Hills themſelves.

IV, *A Letter for the Reverend Mr* William Derham, *F. R. S. Containing his Obſervations concerning the late Storm.*

SIR,

ACcording to my promiſe at the general meeting of the *R. S.* on *St Andrew's* day, I here ſend you incloſ'd the Account of my Ingenious and Inquiſitive Friend *Richard Towneley*, Eſq; concerning the State of the Atmoſphere in that part of *Lancaſhire*, where he liveth, in the late diſmal Storm. And I hope it will not be unacceptable, to accompany his with my own Obſervations at *Upminſter*; eſpecially ſince I ſhall not weary you with a long Hiſtory of the Devaſtations, *&c.* but rather ſome particulars of a more Philoſophical conſideration.

And firſt, I do not think it improper to look back to the preceding Seaſons of the Year. I ſcarce believe I ſhall go out of the way, to reflect as far back as *April*, *May*, *June* and *July*; becauſe all theſe were wet Months in our Southern parts. In *April* there fell 12,49 *l.* of Rain thro my Tunnel. And about 6, 7, 8 or 9 *l.* I eſteem a moderate quantity for *Upminſter*. *In* May *there fell more than in any Month of any Year ſince the Year 1696*, viz. 20,77 l. *June* likewiſe was a dripping Month, in which fell 14,55 *l.* And *July*, altho it had conſiderable intermiſſions, yet had 14,19 *l.* Above 11 *l.* of which fell on *July* 28th and 29th in violent Showers. And I remember the News Papers gave accounts of great Rains that Month from divers places of *Europe*; but the *North of England* (which alſo eſcaped the violence of the late Storm) was not ſo remarkably wet in any of thoſe Months; at leaſt not in that great proportion more than we, as uſually they are; as I gueſs from the Tables of Rain, with which Mr *Towneley* hath favoured me. Particularly *July* was a dry Month with them, there being no more than 3,65 *l.* of Rain fell thro Mr *Towneley*'s Tunnel of the ſame diameter with mine.

From theſe Months let us paſs to *September*, and that we ſhall find to have been a wet Month, eſpecially the latter part of it; there fell of Rain in that Month 14,86 *l.*

October and *November* laſt, altho not remarkably wet, yet have been open warm Months for the moſt part. My Thermometer (whoſe freezing point is about 84) hath been very ſeldom below 100 all this Winter, and eſpecially in *November*.

Thus I have laid before you a ſhort account as I could of the preceding diſpoſition of the Year, particularly as to wet and warmth, becauſe I am of opinion that theſe had a great influence in the late Storm; not only in cauſing a Repletion of Vapours in the Atmoſphere, but alſo in raiſing ſuch Nitro-ſulphureous or other heterogeneous matter, which when mix'd together might make a ſort of Exploſion (like fired Gun-powder) in the Atmoſphere. And from this Exploſion I judge thoſe Corruſcations or Flaſhes in the Storm to have proceeded, which moſt people as well as my ſelf obſerved, and which ſome took for Lightning. But theſe things I leave to better judgments, ſuch as and that very ingenious Member of our Society, who hath undertaken the Province of the late Tempeſt, to whom if you pleaſe, you may impart theſe Papers; Mr *Halley* you know I mean.

From Preliminaries it is time to proceed nearer to the Tempeſt it ſelf. And the foregoing day, *viz. Thurſday, Nov.* 25. I think deſerveth regard. In the Morning of that day was a little Rain, the Winds high in the Afternoon S. b. E. and S. In the Evening there was Lightning, and between 9 and 10 of the Clock at Night a violent but ſhort Storm of Wind and much Rain at *Upminſter*, and of Hail in ſome other places, which did ſome damage, There fell in that Storm 1,65 *l.* of Rain. The next Morning, which was *Friday, Nov.* 26. the Wind was S. S. W. and high all day, and ſo continu'd till I was in Bed and aſleep. About 12 that Night the Storm awaken'd me, which gradually encreas'd till near 3 that Morning. And from thence till near 7 it continued in the greateſt exceſs: and then began ſlowly to abate, and the *Mercury* to riſe ſwiftly. The Barometer I found at 12 h. ½ P. M. at 28,72, where it continued till about 6 the next Morning, or 6¼, and then haſtily roſe; ſo that it was gotten to 82 about 8 of Clock, as in the Table.

How the Wind ſate during the late Storm I cannot poſitively ſay, it being exceſſively dark all the while, and my Vane blown down alſo, when I could have ſeen. But by information from Millers, and others that were forc'd to venture abroad, and by my own gueſs, I imagin it to have blown about S W. by S. or nearer to the S. in the beginning, and to veer about towards the Weſt towards the end of the Storm, as far as W. S. W.

The degrees of the Wind's ſtrength being not meaſurable (that I know of, tho talk'd of) but by gueſs, I thus determine, with reſpect to other Storms. On *Feb.* 7. $169\frac{8}{9}$. was a terrible Storm that did much damage. This I number 10 degrees; the Wind then W. N. W. *vid. Ph. Tr. No.* 262. Another remarkable Storm was *Feb.* 3. $170\frac{0}{1}$. at which time was the greateſt deſcent of the ☿ ever known. This I number 9 degrees. But this laſt of *November*, I number at leaſt 15 degrees.

As to the *Stations* of the *Barometer*, you have Mr *Townley's* and mine in the following Table to be ſeen at one view.

As to *November* 17th (whereon Mr *Townley* mentions a violent Storm in *Oxfordſhire*) it was a Stormy Afternoon here at *Upminſter*, accompany'd with Rain, but not violent, nor ☿ very low. *November* the 11th and 12th had both higher Winds and more Rain; and the ☿ was thoſe days lower than even in the laſt Storm of *November* 26th.

Thus, Sir, I have given you the trueſt account I can, of what I thought moſt to deſerve obſervation, both before, and in the late Storm. I could have added ſome other particulars, but that I fear I have already made my Letter long, and am tedious. I ſhall therefore only add, that I have accounts of the violence of the Storm at *Norwich*, *Beccles*, *Sudbury*, *Colcheſter*, *Rochford*, and ſeveral other intermediate places; but I need not tell particulars, becauſe I queſtion not but you have better informations.

A Table, ſhewing the Height of the *Mercury* in the Barometer, at *Towneley* and *Upminſter*, before, in, and after the Storm.

Townley.				Upminſter.			
Day.	Hour.	Height of ☿		Day	Hour	Height of ☿	
Novr 25	7	28	98	Novr 25	8	29	50
	3		64		12		39
	9 ½		61		9		14
26	7		80	26	8		33
	3		70		12		28
	9 ½		47		9		10
					12 ½	28	72
27	7		50	27	7 ½		82
	3		81		12	29	31
	9 ½		95		9		42
28	7	29	34	28	8		65
	3		62		12		83
	9		84		9	20	07
29	7		88	29	8		25

I have juſt now, ſince my writing, receiv'd an account from a Clergy-man, an intelligent perſon at *Lewes* in *Suſſex*, not only that the Storm made great deſolations thereabouts, but alſo an odd Phœnomenon occaſioned by it, *viz.* " That a Phyſician travelling ſoon after the Storm to " *Tiſehyrſt*, about 20 miles from *Lewes*, and as far from " the Sea, as he rode he pluckt ſome tops of Hedges, and " chawing, them found them Salt. Some Ladies of *Lewes* " hearing this, taſted ſome Grapes that were ſtill on the " Vines, and they alſo had the ſame reliſh. The Graſs on " the Downs in his Pariſh was ſo ſalt, that the Sheep in " the Morning would not feed till Hunger compelled " them, and afterwards drank like Fiſhes, as the Shepherds " report. This he attributeth to Saline Particles driven " from the Sea. —— He heareth alſo, that people about " *Portſmouth* were much annoyed with ſulphurous Fumes, " complaining they were almoſt ſuffocated therewith.

V. *Part of a Letter from Mr* Anthony van Leuwenhoek, *F. R. S. giving his Obſervations on the late Storm.*

Delft, Jan. 8. 1704. N. S.

I Affirmed in my Letter of the 3d of *November* laſt paſt, that Water may be ſo daſh'd and beaten againſt the Banks and Dikes by a ſtrong Wind, and divided into ſuch ſmall Particles, as to be carried far up into the Land.

Upon the 8th of *December*, 1703. N.S. We had a dreadful Storm from the South Weſt, inſomuch, that the Water mingled with ſmall parts of Chalk and Stone, was ſo daſht againſt the Glaſs-windows, that many of them were darkned therewith, and the lower Windows of my Houſe, which are made of very fine Glaſs, and always kept well ſcower'd, and were not open'd till 8 a Clock that Morning, notwithſtanding that they look to the North Eaſt, and conſequently ſtood from the Wind; and moreover, were guarded from the Rain by a kind of Shelf or Penthouſe over them; were yet ſo cover'd with the Particles of the Water which the Whirl-wind caſt againſt them, that in leſs than half an hour they were deprived of moſt of their tranſparency, and, foraſmuch as theſe Particles of Water were not quite exhaled, I concluded that it muſt be Sea water, which the ſaid Storm had not only daſht againſt our Windows, but ſpread alſo over the whole Country.

That I might be ſatisfied herein, I blow'd two ſmall Glaſſes, ſuch as I thought moſt proper to make my Obſervations with, concerning the Particles of Water that adhered to my Windows.

Preſſing theſe Glaſſes gently againſt my Windows, that were covered with the ſuppos'd Particles of Sea water, my Glaſſes were tinged with a few of the ſaid Particles

Theſe Glaſſes, with the Water I had thus collected on them, I placed at about half a Foot diſtance from the Candle, I view'd them by my Microſcope, reck'ning, that by the warmth of the Candle and my Face together, the Particles of the ſaid Water would be put into ſuch a motion, that they would exhale for the moſt part, and the Salts that were in 'em would be expos'd naked to the ſight, and ſo it happened; for in a little time a great many Salt Particles did, as it were, come out of the Water, having the Figure of our common Salt, but very ſmall, becauſe the Water was little, from whence thoſe ſmall Particles proceeded; and where the Water had lain very thin upon the Glaſs, there were indeed a great number of Salt Particles, but ſo exceeding fine, that they almoſt eſcaped the Sight thro a very good Microſcope.

From whence I concluded, that theſe Glaſs-windows could not be brought to their former luſtre, but by waſhing them with a great deal of Water; for if the Air were very clear, and the Weather dry, the watry Particles would ſoon exhale, but the Salts would cleave faſt to the Glaſs, which ſaid Salts would be again diſſolv'd in moiſt Weather, and ſit like a Dew or Miſt upon the Windows.

And accordingly my People found it when they came to waſh the afore-mentioned lower Windows of my Houſe; but as to the upper Windows where the Rain had beat againſt them, there was little or no Salt to be found ſticking upon that Glaſs.

Now if we conſider what a quantity of Sea water is ſpread all over the Country by ſuch a terrible Storm, and conſequently how greatly impregnated the Air is with the ſame; we ought not to wonder, that ſuch a quantity of Water, being moved with ſo great a force, ſhould do ſo much miſchief to Chimneys, tops of Houſes, *&c.* not to mention the damages at Sea.

During the ſaid Storm, and about 8 a Clock in the Morning, I caſt my Eye upon my Barometer, and obſerv'd, that I had never ſeen the Quick-ſilver ſo low; but half an hour after the Quick ſilver began to riſe, tho the Storm was not at all abated, at leaſt to any appearance; from whence I concluded, and ſaid it to thoſe that were about me, that the Storm would not laſt long; and ſo it happened.

There are ſome that affirm, that the ſcattering of this Salt water by the Storm will do a great deal of harm to the Fruits of the Earth; but for my part I am of a quite different opinion, for I believe that a little Salt ſpread over the ſurface of the Earth, eſpecially where it is heavy Clay-ground, does render it exceeding Fruitful; and ſo it would be if the Sand out of the Sea were made uſe of to the ſame purpoſe.

VI. *Part of a Letter from Mr* Anthony van Leuwenhoek, F. R. S. *concerning the Figures of Sand.*

Delft, Dec. 4. 1703. N. S.

I Take the liberty again of ſending you the following Obſervations

I remember I have formerly affirmed of Sand, that you cannot find in any quantity whatſoever two Particles thereof, that are entirely like each other, and tho perhaps in their firſt Configuration they might be alike, yet at preſent they are exceeding different; the Sand eſpecially that we make uſe of is obnoxious to ſo great alterations, that it would be a wonder, if even in its ſmalleſt

Particles, of which there may be a thouſand in one ſmall grain, there ſhould be an exact ſimilitude.

For let us conclude (as I have often ſuppos'd) that our common Sand, of which one grain differs from another in pellucidity, was found at firſt with ſmooth ſides and ſharp points, the ſaid points and ſides are ſo rubbed one againſt t'other, that ſeveral ſmall pits or holes may be perceiv'd in them, whereby they loſe their firſt figure, and who can conceive what changes thoſe Particles of Sand undergo, that lye next the ſuperficies of the Terreſtial Globe, and eſpecially ſuch as lye ſome depth under a ſtony ground where laden Waggons paſs often, for thoſe Particles of Sand, by frequent compreſſions and colliſions, wound each other, indenting holes in their ſides, and breaking off the ſharp Points or Angles; not to mention what alterations are made in theſe ſmall bodies by Storms, Thunder, Earthquakes, *&c.*

After having exerted my poor Obſervations on theſe matters, I got ſome ſhining Sand from an old Gentleman, a Kinſman of mine, who was Preſented with the ſame by a Book-keeper belonging to the *Eaſt India* Company, in the year 1648. and to the beſt of my remembrance Folks us'd to ſtrow their Letters with ſuch a kind of Sand about that time.

This Sand, tho very thin, was not tranſparent, the ſhiningneſs being wholly occaſioned by the reflexion of the Light from the poliſht ſides; ſeveral Particles of the ſaid Sand, which were much bigger than the reſt, did not reflect any Light, tho to the naked Eye they ſeem'd ſmooth; from whence I concluded, that they had loſt their glance by a frequent rubbing their ſides againſt others.

When I viewed ſeveral grains of the aboveſaid Sand with my Microſcope, I was ſurpriz'd to ſee that many of them were hexangular, and the more, when I had ſifted the fineſt from the courſeſt; neither could

I obſerve that any of the Sands were like each other.

I view'd the ſaid Sand with great attention ſeveral times, imagining that by ſome Earthquake or other it might be thrown up from the place where it had lain in reſt, to the ſuperficies of the Earth; and many grains, as I fancy'd, had preſerv'd their original ſhape and figure, for they had received little or no damage, eſpecially the ſmall ones, and many of thoſe had ſuch points and ſides, that no Diamond, tho poliſht by able Workmen, could equal the beauty of it.

I infus'd ſome of this Sand into *Aqua fortis*, to try whether it would diſſolve them, or deprive them of their ſhining quality, and tho it lay in the ſaid Water ſeveral days, I could not perceive any alteration in it.

Moreover, I tried the ſaid Sand with ſo brisk a Fire as was capable of melting Silver, and yet it did not affect either its Figure or Glance.

Theſe Particles of Sand being exceeding ſmall, and not unlike what we call white ſcowering Sand; I thought it worth the while to Deſign ſome of them.

Fig. 1. Tab. 1. A B C D E F repreſents an hexangular grain of Sand that was as bright and ſhining as any poliſht Metal, and the triangular Figures which appeared upon it were as bright as the reſt of the body, which occaſion'd a very agreeable ſpectacle, and could not be contemplated without aſtoniſhment.

I plac'd another grain of Sand before one of my Glaſſes, leſs than the former, but it was flat, and in my opinion, not the 16th part ſo big as a courſe grain choſen out of our common white Sand.

This was a ſurprizing Figure, and the firſt perſons that ſaw it were 3 Painters, who were filled with wonder in viewing it, and one of them, who was not the leaſt among them, offered his ſervice to draw the figure of ſuch a wonderful Sand, and another deſired him to let him to take a Copy of the ſame, that he might let other curious perſons ſee the ſtrange things in ſuch a ſmall body.

In the ſaid Sand, which is deſcrib'd by G H I K L, you may ſee not only, as it were, a ruined Temple, but in the corner of it G H I appear two Images of humane ſhape, kneeling, and extending their Arms to an Altar, that ſeems to ſtand at a little diſtance from them; this was ſtill the more agreeable, becauſe it was as bright as any poliſht Steel.

Fig. 3. M N O P repreſents (as near as the Limner could trace it) another hexangular ſmall Sand, with two ſharp points like Pyramids, and each ſide that compos'd the ſaid points were very ſmooth and ſhining: I have ſeen ſeveral ſuch Sands, that on each ſide had a ſmooth, ſhining and oblique ſuperficies, inſomuch, that upon one ſingle grain I have counted 24 ſuch poliſht ſides or faces.

I have alſo obſerved ſeveral ſmall Sands, that inſtead of terminating their ſix ſides in a ſharp point, ended ſometimes in a Triangle, Quadrangle, and even in a Pent. or Hexangular ſhining flatneſs.

I remarkt ſeveral three ſided Sands, of which ſome were regular Triangles, which were very ſhining and very thin, others were thicker. See Fig 4. Q R. S.

I ſhewed the Painter other Sands that were compleat hexangles,the flat ſides of which appeared to us like a Steel Looking Glaſs in a Frame, and in ſome of them were little holes, which ſeemed to ſome to be likewiſe hexangular; whence I concluded, that ſuch a hole was made from the preſſure of another Sand of the like Figure. See Fig. 5. T. V. W.

When I lookt upon any of theſe Sands ſideways, each of the ſix ſides,which in the Figure appear as a Frame or Border, ſeem'd to be a Poliſht Looking-Glaſs.

Fig. 6. X Y Z does alſo repreſent an Hexangular Sand oppoſed to the ſight a little ſidewiſe, whereby the Reflection is not ſo full and large as if the flat ſide were

placed directly before the eye; but then it came from the two ſides which repreſent a part of the Frame, and are ſhown in this figure by the Letter X.

Now when the hinder part of ſuch a Sand is brought before the ſight, I obſerve that it has the ſame figure, and that then, that part of it, which I ſhould have deſcribed as a dark circle of the ſhining Sand, was compos'd of twelve bright, oval, flat ſuperficies.

I gave the Limner another hexangular Sand to draw, whoſe bright Superficies or Area was of a different make from its circumference, for there appear'd in the middle of them ſeveral triangular figures, which, tho they were ſomething rais'd or imboſt, were very bright, which was very pleaſant to behold; ſee Fig. 7. A B C, and altho the circumference in this poſition appear'd very dark, yet the ſides thereof, when oppos'd to view, were no leſs bright and ſhining.

I caus'd the Painter to deſign another grain of Sand, which is repreſented by Fig. 8. D E F G H with its protuberant parts and their reſpective ſides; but it is impoſſible to deſcribe with the Pen the beauty and variety of the figures in the ſaid Sand, neither can any body imagin it but thoſe that ſee it.

I turned the oppoſite ſide of the ſaid Sand to my Glaſs, whereby I diſcover'd the ſeveral ſhining Angles thereof, as in Fig. 9. I K L M.

I placed another ſmall ſhining Sand before my Glaſs, which appear'd as in Fig. 10. O P Q R, ſeveral of whoſe ſides were unblemiſht; in a word, if I ſhould undertake to give you a view of a thouſand others, and ſhould enter upon a ſtrict examination of every one of them, I doubt not but we ſhould diſcover every one of them to be of a different ſize and figure, beſides ſeveral other particularities which might be peculiar to each one, as the great Rent or Breach, which in fig. 8. is deſcrib'd by a a.

I have alſo obſerv'd that this ſhining Sand weighed twice as heavy as our common ſcowring Sand.

Now when I took ſome of the Pellucid or Tranſparent Sand (which did not ſhine, becauſe it reflected no light) I obſerved that the ſides and angles of each Grain were freer from ſcars and blemiſhes than moſt others I had yet conſider'd, from whence I concluded, that ſuch Sand had not lain long near the ſuperficies of the Earth.

I placed one of theſe Sands before a Microſcope, ſo as the Painter might have a full view of three of the four oblique ſides, ſee Fig. 11. A B C D E F, one of the flat ſides being repreſented by B C D G, another D E A G, which had a ſtreak or ſcratch in it, ſuppos'd to be done by the preſſure of another Sand upon it; and the third flat ſide is deſcribed by B G a b.

Having repreſented this tranſparent Sand in its ſhorteſt poſition, I put it in another ſight, ſo as you might ſee it in its full length, as in Fig. 12. H I K L M, and therein ſtreaks or little holes, which I firmly concluded to be occaſioned by the colliſion of other Sands.

I likewiſe took notice of ſome, but very few, Sands that were long and ſlender, and which did not appear bigger thro a common Microſcope, than a ſingle hair of ones Beard to the naked Eye.

I have taken ſeveral of the ſhining Sands and broke 'em to pieces, and then viewed the broken pieces thro a Microſcope, and obſerved, that many of thoſe ſmall Particles, tho they were a thouſand times leſs than a grain of common Sand, had a glance or luſtre when the light fell upon them, and that ſeveral ſuch particles, and ſome that were larger, if you lookt upon them againſt the light, repreſented a fine blooming red; but ſome of them were ſo but in part, from whence I concluded, that part which was not red was thicker than the reſt, and did not admit of light thro it. Among theſe ſmall broken pieces of Sand, I obſerved ſome that had ſix ſides, others that were iangular ; all theſe Sands are to be conſidered as common Sand.

I took one of the above-mentioned long ſlender Sands, which I judged alſo to be one of the thickeſt, and placed it before a Microſcope, as you may ſee in Fig. 13. N O P Q, in which you may diſtinctly perceive four flat ſides.

I have obſerved in many Sands, that their bodies conſiſted of unſpeakably thin ſcales or ſcaly particles.

Among theſe ſhining Sands I diſcovered others that had no luſtre at all, neither had any of their particles after I broke them to pieces, but it appeared to be a dark red matter, and in other Sands ſo broken there was not only a red matter, but even an hundred ſhining particles, all proceeding from one Sand.

I have alſo ſeen ſome Sands, that in the middle of their ſhining ſides repreſented ſmall figures that gave no luſtre, but as I viewed them more narrowly, I found it was a red matter, incorporated as it were in the Sand.

I have placed ſeveral Sands of the courſeſt ſort before a Microſcope for the pleaſure I took in the viewing them, for one ſeemed to repreſent an agreeable Rock of Stone, another, a deep Cavern, inſomuch, that ſeveral perſons whom I made partakers of the ſight, were aſtoniſht to ſee ſuch various figures in ſuch ſmall bodies.

Theſe laſt Sands were not, I ſuppoſe, ſo ſhaped from the beginning, but thoſe cavities and protuberances which we eſpyed in them, came from various chances and accidents, as by the colliſion of other particles of Sand which were bigger than theſe, which in their turn were again broken by other bodies of a larger ſize, ſuch as Pebble ſtones, *&c.*

I have cleaved ſome grains of Sand, and diſcovered figures of Triangles in them.

I have by me ſome draughts of Stone compos'd of particles of Sand, but becauſe I will not heap up too many things together , I ſhall break off here.

Delf *in* Holland, February 1. 1704.

SOon atfer that the Cathedral Church at *Utrecht* was almoſt ruined by the dreadful Storm, my curioſity led me to view the fallen Pillars and other parts of that Building that lay about, and I obſerved, that ſeveral of the Pedeſtals were compos'd of red Stone, as alſo ſome Tombſtones; and that in another Church there was a whole Pillar of ſuch Stone,and foraſmuch as neither in our Town, nor any other Town that I know of, this ſort of Stone is made uſe of by Maſons in the building of Houſes, I took ſome of it home with me, in order to obſerve it with my Microſcope, and I did then imagin that that ſort of Stone conſiſted for the moſt part of large and tranſparent corns of Sand, and that the redneſs of the Stone was only caus'd by a certain red matter, which had produced ſuch a continuity or adheſion in the maſs of the Sand, as to be able to conſolidate it into a red Stone.

Being of this opinion, as I ſaid before, I took the little piece of red Stone, and ſeparated ſeveral Sand-particles from it as gently as I could; and becauſe the red matter which clung to ſome of the Sands more than others, hinder'd me from taking a diſtinct and clear view of each particular corn, I put ſome of them into *Aqua Fortis*, to try whether that would diſſolve the red matter, and reſtore its luſtre to the Sand; but in vain, for that Menſtruum was not able to ſeparate 'em. Then I took ſeveral of thoſe Particles of Sand that were ſurrounded with the leaſt of ſuch Red Matter, and placing them before the Microſcope, obſerved that ſome of 'em had ten or more ſharp Points or Protuberances, ſo *neatly* and regularly faſhioned, that no Poliſhed Diamond could out do them. I ſet one of the largeſt Corns of Sand before my Glaſs, and could perceive in the ſame, and that too in a very ſmall compaſs, ſeven neat Prominent Points (exceeding one another in length and bigneſs) iſſuing out of very ſmooth ſides; and I judged that one ſuch Sand was furniſht with above a hundred flat ſides, which were very ſmooth, and conſequently very ſhining, tho with the naked eye one could diſcover no brightneſs worth mentioning; the reaſon of which I conceive to be, that this Sand being partly tranſparent, admitted the light thro its Pores, and did not reflect it back like ſhining Sands.

Theſe Sands, tho I viewed never ſo many of them, I found to be each of a different figure, and when I pickt out any of them that were ſomewhat oblong, I ſeldom failed to diſcover at the ends a four or five ſided obtuſe point, ſo neat and regular as if it had been poliſht.

I broke to pieces ſeveral grains of Sand upon a clean Glaſs, and found that they were not near ſo ſtrong as the ſhining Sand, and having placed the ſmall particles of ſuch a broken Sand before my Microſcope, ſome of them appeared like whole Sand with its entire ſides and angles.

This was a very agreeable ſpectacle to me, to ſee ſo many neat ſmooth ſides, and ſo many exact points and angles all derived from a ſingle grain.

Tho it is impoſſible for any Limner to deſcribe theſe points and ſides exactly, yet I caus'd ſome to be deſign'd as well as I could.

Fig 1. Tab. 2. A B C D E repreſents thro a Microſcope one of the above-mentioned Sands, of which many together compoſe the Red Stone; A B C D ſhows the points, which are much more plainly ſeen than ſeveral others that cannot be diſtinguiſht, becauſe of their different poſitions.

Fig. 2 ſhews you another Sand which likewiſe has ſeveral points, tho not ſo obvious as the former, becauſe they do not ſtand ſo far outwards.

Fig. 3. M N O P repreſents the laſt mentioned Sand, only with this difference, that you ſee it in another poſition.

Fig. 4. Q R S T ſhews alſo a Sand of the aforeſaid Stone, in which, you may obſerve the Diamond cut better than the former.

Fig. 5. V W X Y Z repreſents two grains of Sand that were ſtill joyned to each other, the one is deſcribed by V W X wherein you may obſerve ſeveral points, and particularly between W and X, and the other is ſhown by X Y Z, and the moſt of its points lye between Y and Z.

Now as ſome of the ſmooth ſides of theſe Sands were large, and others ſmall, and that all of them were not ſo ſmooth as poliſht Glaſs, and had ſeveral ſmall ſcratches or ſlits in them, I do ſuppoſe that might happen by the breaking or diviſion of theſe ſandy particles from one another.

That piece of the Red Stone that ſtill remain'd entire was about the bigneſs of a Pea, and when I beat it in pieces, there flew a ſpark of Fire out of it.

I made a ſmall bit of it ſo hot, that it was glowing, and ſo let it drop into water, ſuppoſing, that not only the particles of Sand would be ſeparated thereby, but that the red matter alſo which conſolidated the Sand would be divided from it too; but I found that the Sands only were ſeparated from one another, and each particle of Sand was as ſtrong as if it had never been in the Fire, and was alſo ſurrounded with the red matter; but in ſome of them, which had aſſumed a greater tranſparency than before, I could plainly diſcover that each Particular grain did conſiſt, or rather was a congeries of ſeveral ſmall particles, of which you ſhould ſee in ſome Sands, fifty ſuch ſtanding out, like pointed pyramids, all tranſparent, and ſome of them had the ſame figure as the grain of Sand it ſelf had.

By theſe Obſervations I was fully ſatisfy'd, that the Sands of which the above-mentioned red Stone was compos'd, had for the moſt part preſerv'd their original Figure, and that they were ſo hard and ſolid, that their falling one upon another could not produce any adheſion, otherwiſe than by the intervention of that red matter, which was interſpers'd and mixt with them.

From theſe remarks, I naturally turned my thoughts to Diamonds, and my hypotheſis is, that all the Diamonds that have or ſhall be diſcover'd, do not grow, nor are made in any ſeries of time, but were form'd like other Sands, in the beginning of the World, for how is it poſſible that ſuch a pelluid body can be produced in the Bowels of filthy Earth, by a congealing or coagulated ſuccus or moiſture; and if it were ſo, why don't we meet with very large Diamonds? for when a ſmall Diamond is once form'd, there would be a more than ordinary conflux of the ſame plaſtick matter thereto, as we find in other things, that they have always a ſtrong tendency or inclination to ſubſtances of a homogeneous nature with themſelves.

I have been aſſured that in ſome places, Water does filtrate thro the Rocks into the ſubterraneous Caverus, and coagulate at the top of thoſe Vaults or Particles like Nine-pins, and at laſt are really petrify'd.

We may allow this to be true, but if theſe Nine-pin kind of particles, which I look upon to be nothing elſe but a petrify'd Salt, were obſerved with a Microſcope, and compared with the ſame Particles of the Rock, from whence the above mentioned Filtration proceeds, I make no manner of doubt, but that the Nine-pin like Particles would be found to differ from the other.

That I might be ſatisfy'd in my above mentioned Obſervations, I took a piece of white Marble that was brought hither from *Italy*; it was of two ſorts, the one was ſtrong, and the other light and very brittle.

I broke the brittle Marble as gently as I could, that the configuration of the ſmall particles might not be much altered, and having viewed ſeveral of them with my Glaſs, I ſaw abundance of wonderful particles, which may juſtly be ſtil'd Sands with their regular ſides and angles, and many of them of the ſame figure as the ſhining Sand.

But not being ſatisfied with this hypotheſis, *viz.* that the above-mentioned particles were originally nothing elſe but Sand particles, with their angles and ſmooth ſides, and that at the time of their coalition or falling upon one another, they were all ſoft and flexible, and thereby were ſo rivetted and joyned together, as to become one ſolid body, which we call Marble, and conſequently the ſaid particles did for the moſt part change their figure and aſſumed another form, proportionable to the ſolidity of their coalition, and that yet ſome of them had preſerved thoſe ſmooth ſides and angles, which they had at the time of their conjunction, the which angles and ſides repreſent the points that are found in Diamonds, and that in one particle of Sand you may diſcover three, and in another ſeven neat and regular points.

From theſe Obſervations, I imagined that almoſt all the Sand of the whole Earth have preſerved the figure that was given to it at the Creation, and that the particles thereof before they happened to collide or fall upon others, were compos'd of ſuch hard bodies, that they could not be joyn'd to others, and ſo have remained what they were originally; ſaving that by their frequent colliſions with other bodies their firſt figure may be ſomething impaired, and the nearer they lye to the ſurface of the Earth, the more ſubject they are to ſuch alterations.

When I oppos'd ſuch a Diamond-like Sand with its point to the ſight, I could ſee the ſaid point, but the ſides from whence the points ariſe, are the more obvious; and ſuch poſition the Sand would appear four, five or ſix ſided, and not only ſo, but where two ſides joyned, I could alſo perceive ſuch a point of a Diamond-cut ſtanding out.

I have thought fit to cauſe three of the Sand particles of the above-mentioned white Marble, as they were ſeparated from each other to be deſign'd.

Fig. 6. A B C D E F repreſents one of thoſe grains of Sand, of which a great number compoſe the white *Italian* Marble ſtone, wherein at each of theſe Capital Letters you may ſee its points or angles.

Fig. 7. G H I K L M ſhews you the ſecond Sand, and thoſe Letters the ſeveral points.

Fig. 8. N O P Q is the third Sand, wherein there is ſuch a flatneſs N O P, as is obſervable in few Sands.

I took a little piece of the ſaid Marble, the parts of which were very cloſe and compact, and making it red hot I dropt it in the Water , in the doing whereof, I obſerved not only the Sand particles were ſeparated from one another,but ſome of them broke away with that violence, that they were thrown out of the Water.

I took ſome of this Water preſently, in order to ſee what Salts were paſt over from the Stone into the Water ; and I could ſoon perceive a ſort of a Membrane, or rather Scum over the Water, without being able to diſcover any Particles in the ſaid Scum, the which I conceived to conſiſt of coagulated Salts ; and that there were ſome ſuch under the Scum ; but they were ſo obſcure that I could not much count upon them ; and the more, becauſe they were hid by the ſaid Scum.

I took then a larger piece of the above-mentioned Stone, and heating it red hot, I let it fall into the Water alſo, whereupon there came a thicker Scum over the Water, which I let lie upon it 24 hours, and then breaking it, and taking a little out of the Water, I found it hard and petrify'd, and placing it before my Microſcope,

to

to diſcover (if it were poſſible) the figure of thoſe Particles; I could not however compaſs my Intentions, tho I often repeated the Tryal, by reaſon of the ſmallneſs of the Particles, and their ſtrict union with each other; only a few of them appear'd to me four and ſix-ſided, and to reflect the Light from ſo many Parts; others that were bigger were compos'd of ſome three, ſome four ſmaller Particles, which we may thus reckon to be Salt Particles.

Several thouſands of theſe little Particles lay in a very ſmall ſpace, which being ſeparated and broken in pieces, I judged that each Particle did conſiſt of many more and much ſmaller ones; and indeed they were ſo ſmall that they almoſt eſcaped my ſight, thro the beſt of my Microſcopes.

I tryed ſome of the above-mentioned particles in a pretty ſtrong Fire, and found that they loſt ſome of their tranſparency thereby, and were divided into ſmaller particles that were quite dark and obſcure.

After this, I took a little of that Water which lay under the ſuperficies of the ſuppoſed coagulated Salts, imagining I ſhould find ſome Salt-particles in the ſaid Water, and putting it upon 3 ſeveral clean Glaſſes, I obſerv'd after the ſpace of 4 hours the Water to be quite exhal'd, and that there remain'd many thouſands of Salt particles out of one ſingle drop of Water, the which Salts were all ſeparated from one another, many of their ſuperficies being very bright, but their ſides dark; and I could clearly perceive that ſome of their ſuperficies were ſhining, and their figure quadrilateral; the darkneſs of whoſe ſides I judged to be, becauſe thoſe Salts were ſquares, in ſhape like Dice; between theſe Salt particles lay others that were much ſmaller, and I believe of the ſame figure too, but becauſe of their ſmallneſs I could make no certain judgment of them.

After that, the Water which lay very thin was ſuddenly exhaled, I ſaw ſeveral Salts that were larger than the reſt, and more irregular in their figures, but coagulated together, ſome of 'em were ſquares, but not regular.

I took about ten times as much Rain water, and mingl'd it with the above-mentioned Salt water, and then obſerv'd that the Salts were not diſſolv'd, but emerg'd to the top of the Water, but when I preſt the ſame Salt Particles under Water, ſo as to wet them all over; they ſubſided to the bottom, and remained there without being diſſolv'd, or uniting themſelves to the ſaid Water.

Now ſeeing the great number of Salts extracted from the aforeſaid Stone are of ſo obſtinate and tenacious a figure that nothing but Fire can divide them, and then too they are ſuch inflexible bodies, that they cannot be diſſolved in Water; we may well conclude that the grains of Sand which compoſe ſuch Stones were not only ſoft at the time of their coalition or union with each other, but alſo at the ſame time there intervened a very inflexible fixt Salt (in lieu of Mortar) between the particles of Sand, unleſs you will chuſe to ſay, that each particle of Salt do in ſome degree conſiſt of ſuch fixt Salts.

After this, I took a piece of Hearth ſtone called *Benthemer* ſtone, becauſe it is found in Quarries in the County of *Benthem*, and is brought to us in great or ſmall Blocks or Parcels; this Stone was ſo ſoft that I could eaſily crumble it between my fingers, as I did, and viewing it with one of my Glaſſes, could perceive nothing but particles of Sand, without the leaſt ſmooth ſide, or regular corners; and it ſeemed to me moreover, that this Sand had acquir'd a ſort of conglutination, or was grown into a ſolid ſubſtance, which we call Stone, a long time after it had been nothing but Sand, and its particles had been worn and collided againſt each other; my reaſon is, becauſe this Sand that had been lately Stone, in the ſides of every grain of it was as full of ſmall holes and breaches as any Sand I ever ſaw; and in viewing them one would imagin that they were compos'd of thouſands of ſmaller particles, and that ſome of them were of a triangular, others of an exact flat quadrangular figure; and when I obſerved theſe Sands in reſt, I judged that the original ſhape of many of them were hexangular, and many were pointed like Diamonds, and thoſe points proceeded or iſſued forth of ſmooth, flat ſides.

The chips and pieces of the *Benthem*-ſtone, as well thoſe that are found in the Pits, as thoſe that are chizel'd off in the working of the ſame by our Stone-cutters, are not thrown away as uſeleſs; but they break them with Hammers almoſt as ſmall as Sand, and the Powder or Crumbles of 'em is what we call *Bik-ſtone*, and is uſed to clean Wooden-work, being very proper to fetch off the filth from Wooden Veſſels, which is not ſtrange, conſidering what ſharp Angles ſuch beaten Stone conſiſts of, not unlike our common Sand. I took a ſmall bit of the ſaid Stone which was very hard, and wrapping it up in Paper, with a little Hammer broke it in pieces, but could obſerve no other difference between the former Sand and this, excepting, that the particles of the laſt were much ſmaller.

I took a piece of another Stone, which we call Alabaſter Stone, and of which, little or none comes to us, ſave what is wrought into Images, *&c.* and having viewed it ſeveral times, I obſerved after breaking or beating it very ſmall, that the little particles were very thin and pellucid, and their figure a long and flat ſquare, with two ſharp corners and two blunt ones; and tho I ſaw among them ſome others that were not quite ſo regular, yet I fancy'd that that exactneſs and regularity of their figures had been loſt in the violent ſeparating them from one another.

The above-mentioned particles, were for the moſt part ſo exceeding ſmall, that they could hardly be ſeen thro my beſt Microſcope, but ſome of them (whoſe figure being greater, I could more eaſily diſcern) appeared to be compoſed of very thin parricles lying upon each other.

Now, when I viewed thoſe particles of Stone that were as large as grains of Sand, I found that each of them was compoſed of ſeveral thouſands of ſmaller particles, whoſe ſhape I could not for my life diſcover; and when I made a little bit of the ſaid Stone red hot and dropt it into the Water, it diſſolv'd into a white ſubſtance as fine as Meal or Flower, and thereby loſt all its tranſparency, and each particle, tho its figure had been a longiſh ſquare, was now compos'd of ſuch ſmall particles, that it was impoſſible to perceive any ſhape it had.

After this, I took another little piece of Stone, which is called a Mineral-ſtone, and was brought hither from *Sumatra*; the which was ſo rich, that the hundred weight of it contained near fifty Gilders of Silver, and thirty in Gold.

I took of the ſaid Stone about the bigneſs of a common Bean, and putting it over a pretty ſmart Fire, the Sulphur, of which there was a great deal in the Mineral, ſtood in bubbles, and remained upon the Stone in the figure of round, black, burnt Globules; then I dropt it red hot into Water, where it remained whole, only with this difference, that whereas before it was very hard, now it became very brittle, and having broken it, I perceiv'd it to conſiſt of irregular particles chiefly, tho ſome few were of an exact Diamond-cut; but that which pleaſed and ſatisfied me moſt, was, that I could behold much more plainly than before, the globules of Gold and Silver lying ſeparately from one another, but ſome of the former were ſo exceeding ſmall, that they almoſt eſcaped the ſight in the Microſcope; and foraſmuch as the Gold is not near ſo eaſy to be melted as the Silver, I ſaw ſome that the Fire had not force enough to reduce it to globules, and upon it lying a ſmall globule of Silver, which the Fire had brought into that figure; and tho the Gold and Silver toucht each other, yet they were not united, becauſe the Fire where that Gold lay was not ſtrong enough to reduce it to a fluid body.

I have often obſerved in theſe Mineral Stones, that one part of 'em was white, and another a little lower in the ſame Stone a dark grey, and that they are brought to us in little pieces, the biggeſt not exceeding a joint of ones Finger, and that in ſome few pieces there were little cavities or breaches, wherein I never met with any Metal, either of Gold or Silver (for in that Mineral there is no other) but oftentimes with very ſmall Cryſtals; I call them ſo, bacauſe of the analogy of their Figures with thoſe of Rock-Cryſtal, for like them they are tranſparent, hexangular, and end in a point or ſpire.

Theſe Cryſtals were in the white part of the Stone, for thoſe that were in the grey were not pellucid.

I cauſed a ſmall particle of ſuch Cryſtal, ſo as it appeared thro my Glaſs, to be deſigned by the Limner, and Fig. 9. R S T V repreſents it as bright and clear as ever you ſaw any Cryſtal; I have ſeen ſome that were not near ſo tranſparent, but indeed they were taken out of Mineral ſtones that were of a dark grey colour.

Some are apt to believe that theſe Cryſtals are form'd by the exhaling damps or moiſtures deep in thoſe Mines, from whence the Mineral ſtone is dug; but this is contrary to my ſentiments, for upon that hypotheſis, the whole cavities ſhould be fill'd with the particles, whereas we find the contrary, for I have obſerv'd that not one fourth part of the cavities are filled therewith; and I have found ſome of the ſaid Cryſtals in ſuch ſmall cavities that a pins head would have fill'd them, and in breaches of the Mineral ſtone that were not ſo broad as a ſmall pin is thick, whereas I could meet with none of theſe Cryſtals in other cavities that were much larger.

I will rather ſuppoſe that moſt of the ſtony matter where thoſe cavities are found, was of the ſame configuration as the ſaid Cryſtals, and at the ſame time of the coalition or union of the particles of Stone, the intercepted Air occaſioned ſome cavities, in which the Cryſtals were ſhut up, and in which they acquired the figure which they now retain ; in the mean time the other parts about theſe cavities were ſo firmly united as to become a hard and ſolid Stone.

Before that I conſider'd the conjunction of the particles of divers Stones, I imagined that theſe particles were united to each other by ſuch a fixt Salt, that nothing but Fire could ſeparate them ; but I am convinced now that this ſuppoſition will not hold in all Stones.

VI. *Part of two Letters from Mr* Thoresby, *F. R. S. to the Publiſher, concerning an Earthquake, which happened in ſome places of the North of* England, *the 28th of December,* 1703.

YOU have heard, no doubt, of the late *Earthquake* that affected ſome part of the North, as the dreadful Storm did the South ; it being moſt obſervable at *Hull*, I was deſirous of an account from thence, that might be depended upon, and therefore writ to the very obliging Mr *Banks*, Prebendary of *York*, who being Vicar of *Hull*, was the moſt ſuitable perſon I knew to addreſs my ſelf unto, and he being pleaſed to favour me with a judicious account of it, I will venture to communicate it to you, with his pious reflection thereupon. 'As to the 'Earthquake you mention, it was felt here on *Tueſday*, 'the 28th of the laſt Month, which was *Childermas* day, 'about 3 or 4 minutes after 5 in the Evening ; I confeſs I 'did not feel it my ſelf, for I was at that moment walking 'to viſit a ſick Gentleman, and the noiſe in the Streets, 'and my quick motion, made it impoſſible, I believe, for me to feel it ; but it was ſo almoſt univerſally felt that there can be no manner of doubt of the truth of it.

'Mr *Peers*, my Reader, (who is an ingenious good man) was then at his Study, and writing,but the heaving up of his Chair and his Desk, and the ſhake of his Chamber, and the ratling of his Windows, did ſo amaze him, that he was really affrighted, and was forc'd for a while to give over his work ; and there are twenty ſuch inſtances amongſt Tradeſmen, too tedious to repeat. My Wife was then in her Cloſet, and thought her *China* would have come about her Ears, and my Family felt the Chairs mov'd, in which they were ſitting by the Kitchen Fireſide, and heard ſuch a rattle of the Pewter and Windows as almoſt affrighted them. A Gentlewoman not far off ſaid, her Chair lifted ſo high, that ſhe thought the great Dog had got under it, and to ſave her ſelf from falling, ſlipt off her Chair. I ſent to a houſe where part of a Chimney was ſhak'd down, to enquire of the particulars ; they kept Ale, and being pretty full of Company that were merry, they did not perceive the ſhock, only heard the Pewter and Glaſs windows dance ; but the Landlady's Mother, who was in a Chamber by her ſelf,felt the ſhock ſo violent, that ſhe verily believ'd the houſe to be coming down (as part of the Chimney afore-mention'd did at the ſame moment) and cryed out in a fright and had fal'n,but that ſhe catched hold of a Table.It came and went ſuddenly,and was attended with a noiſe like the Wind, tho there was then a perfect Calm.

From other hands I have an account that it was felt in *Beverly*, and other places, at *South Dalton* particularly, where the Parſons Wife (my only Siſter) being alone in her Chamber, was ſadly frighted with the heaving up of the Chair ſhe ſate in, and the very ſenſible ſhake of the Room, eſpecially the Windows, *&c.* A Relation of mine, who is a Miniſter near *Lincoln*, being then at a Gentlemans houſe in the Neighbourhood, was amaz'd at the moving of the Chairs they ſat upon, which was ſo violent, he writes every Limb of him was ſhaken; I am told alſo from a ſure hand, that ſo nigh us as *Selby*, where Mr *Travers*, a Miniſter, being in his Study writing, was interrupted much what as Mr *Peers* above-mentioned, which minds me of worthy Mr *Banks*'s ſerious concluſion. ‘And now I hope you will not think it unbecoming my character to make this reflection upon it, *viz*. that Famines, Peſtilences and Earthquakes, are joyned by our Bleſſed Saviour, as portending future calamities, and particularly the deſtruction of *Jeruſalem* and the *Jewiſh* State, if not the end of the World, *St Matth*. 24. 7. And if, as Philoſophers obſerve, thoſe gentler convulſions within the bowels of the Earth, which give the Inhabitants but an eaſie jog, do uſually portend the approach of ſome more dreadful Earthquake; then ſurely we have reaſon to fear the worſt, becauſe I fear we ſo well deſerve it, and pray God of his infinite mercy to avert his future Judgments.

SInce my former Account of the Earthquake at *Hull*, my Couſin *Cookſon* has procured to me the following Account from his Brother, who is a Clergyman near *Lincoln*, *viz*. that he, being about 5 in the Evening, *December* the 20th paſt, ſet with a neighbouring Miniſter at his houſe about a mile from *Navenby*, they were ſurpriz'd with a ſudden noiſe, as if it had been of two or three Coaches driven furiouſly down the Yard, whereupon the Servant was ſent to the Door, in expectation of ſome Strangers, but they quickly perceiv'd what it was by the ſhaking of the Chairs they ſat upon, they could perceive the very Stones move; the greateſt damage was to the Gentlewoman of the Houſe, who was put into ſuch a fright that ſhe miſcarried two days after: he writes, they were put into a greater fright upon the Faſt day, when there was ſo violent a Storm, they verily thought the Church would have fallen upon them. We had alſo at *Leedes* a much greater Storm the night preceding the Faſt, and a ſtronger Wind that day, than when the fatal Storm was in the South, but a good Providence timed this well, to quicken our too cold Devotions.

VIII. *An Account of a Book*, viz.

Euclidis quæ ſuperſunt omnia Gr. Lat. ex recenſione Davidis Gregorij, M. D. Aſtronomiæ Profeſſoris Saviliani, & R. S. S. Oxon. 1703. Folio.

THE Univerſity of *Oxford* intending to publiſh all the *Greek* Mathematicians, have begun with *Euclid*, as the ſtandard Writer of the Elements of Geometry and Arithmetick. In this Edition is publiſhed whatever has been believed to be *Euclid*'s by any conſiderable Mathematician. But many things having been attributed to *Euclid* that are not his (as in after ages it happened to men of ſo eſtabliſhed fame as he has been for above 2000 years) Dr *Gregory* in the Preface, after a ſhort ſummary of *Euclid*'s Life (as far as can be gathered from the Writings of the Antients, who were aſhamed to ſet down particulars of him, who was ſo much and univerſally known) gives not only a deſcription of every particular Book, but alſo his opinion whether it be truly *Euclid*'s or not, with his Reaſons.

Firſt of all are the *Elements*, which make two thirds of the whole Volume. The firſt thirteen Books are certainly *Euclid*'s. The fourteenth and fifteenth are by moſt thought to be *Hypſicles*'s of *Alexandria*. There are no

Scholia, no Explications added to the Elements (being thought needleſs to a Book of Elements, written with ſo much Judgment as this is) nor any Notes, except in ſome very few places, where there are various Readings that are material, or where the Text is manifeſtly corrupted.

Next come the *Data*, which are undoubtedly *Euclid's*, yea, more undoubtedly than the Elements themſelves. For many have ſaid that *Theon* did quite change the Elements, and ſupply their demonſtrations, but never any body queſtioned whether the *Data* are *Euclid's*. Dr *Gregory* in the Preface compares this Book with *Pappus's* deſcription of it, reſtores ſome places in it that have been corrupted, and ſhews the uſe that the Antients made of theſe *Data*.

The two *Muſical Tracts* follow, which the Editor thinks are not both *Euclid's*, it may be neither, as is fully ſet forth in the Preface.

Next are *Euclid's Phænomena*, which were never before publiſhed in *Greek*. This Book is not doubted to be *Euclid's*, it agreeing with *Pappus's* deſcription of it. Dr *Gregory* has reſtored its own original figures, which *Joſephus Auria*, in his Tranſlation, had changed for others far leſs convenient and intelligible.

After this comes the *Opticks* and *Catoptricks*, which, if not ſpurious (for *Proclus* indeed mentions Books of *Euclid* concerning theſe ſubjects) are very much corrupted, as in the Preface is fully ſhewn. To theſe are added the Notes of the Noble and Learned Sir *Henry Savile*, Founder of the two Mathematical Chairs in the Univerſity of *Oxford*, which he wrote on the Margin of his own Book, and which ſhew that he was as great a Maſter in Mathematicks as he was a Patron of them.

Next in order is the Book *de Diviſionibus*. This commonly goes under the name *Machometes Bagdedinus*. But becauſe there is no other Book extant of *Euclid's* with this Title, altho it is clear from *Proclus* that he wrote ſuch a one; and becauſe Mr *John Dee*, who tranſlated it, thinks that this is *Euclid*'s, it was thought proper to publiſh it here. To this alſo are joyned ſome Notes of Sir *Henry Savil*, which exceedingly clear the matter.

Laſtly, there is a *Fragment de Levi & Ponderoſo*, publiſh'd by *Hervagius* in *Latin*, and by *Tatraglia* in *Italian*, which commonly paſſes for *Euclid*'s. Theſe two laſt are not to be found in *Greek*, they being loſt if ever they were in that language.

There are ſeveral other of *Euclid*'s Works, mentioned by *Pappus* and *Proclus*, that are quite loſt. Theſe Dr *Gregory* deſcribes at length in the Preface, to which we remit thoſe that are curious.

LONDON,

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PHILOSOPHICAL TRANSACTIONS.

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I. *A Letter of Dr* William Oliver, *F. R. S. concerning a* Calenture.

S I R,

IN the month of *Aug.* 1693 I was called upon about four a Clock in the morning, to ſee a Sailer on board the *Albemarle* Man of War, in a violent Calenture. He was between 30 and 40 years of age, brown hair'd, pretty tall, but thin, and had not much fleſh about his Bones. When I ſaw him firſt, I found him in the hands of 3 or 4 of his Comrades, who were hardly able to manage him, becauſe of his ſtrugglings, and conſtant endeavours to get from them. I obſerved, he very often cryed out, he would go into the green fields ; his looks were as furious and wild as thoſe of a Lyon, and every now and then he would heartily curſe thoſe that held him. The firſt thing I did was to examine his Pulſe, I felt, 'tis true, a diſorderly motion of the Blood in the Artery, and a burning fiery heat all over his habit of body, but cou'd perceive no diſtinction, or vibration of Pulſe at all. The Surgeon of the Ship, a good experienc'd man in that way, had, before I came, attempted to bleed him but tho the Vein of the Arm was fairly open'd, yet cou'd he not procure an ounce of Blood from thence. Upon that I order'd him to open the frontal Vein which ſucceeded no better, for that ſoon ſtopt too. This put me upon trying a third time, what effects the opening the Jugular Vein might have. From this Vein, tho our Orifice was pretty large, we had about 2 Ounces of florid thick Blood, and then it quite ſtopt there too. I was, I muſt confeſs not a little ſurpriz'd at this; and order'd the Surgeon to unbind his Arm, and try whether he could make him bleed again at that Orifice, which I remember

member he did in a ſmall quantity, and then ſtopt as before. However, having three Orifices open at that time, we drew blood ſometimes from one, and ſometimes the other, where we ſaw it run moſt freely. After ſeveral eſſays of this kind, I always obſerved as the Veſſels emptied, he bled more freely, and at laſt as faſt as I deſired.

Now I was all along of opinion, we ought to continue his bleeding till we ſaw ſome viſible alterations, and conſiderable abatements of his Symptoms, which happen'd in about half an hours time after I ſaw him, and then I felt his Pulſe again, which now began to beat diſtinctly, but very quick. Not long after this, for he bled well enough now, I obſerv'd his Strugglings were not ſo ſtrong, his Ravings and crying after green Fields left off, his wild Looks much abated, and not only his Pulſe had recovered its due and regular Vibrations, but his heats were moderated too, and the Fury of his Spirits lay'd to that degree, that he that juſt now was as furious as a Lyon, was grown ſo tame, that one man was able eaſily to manage him as he pleaſed. In this half hour, as near as we cou'd gueſs, we took from him about fifty ounces of Blood from the three Orifices mention'd. By this time I thought we had enough, ſo I order'd him to his Hammack, as ſoon as we had ſecured the Orifices from bleeding again, and directed the Surgeon to give him an Ounce of Diacodium in a draught of Barley Water, as he went into it: Upon this he ſlept till about Noon, when he awaked with no other Complaint, but of weakneſs from his loſs of Blood, and a ſoreneſs all over his Body, occaſion'd, I preſume, from his violent Convulſions and Endeavours to get looſe.

This was the only Calenture I ſaw all the while I was in the Fleet for near three years, two Summers of which I ſerv'd in the *Mediterranean*, and this happen'd in the *Bay of Biſcay*, in the Latitude of 47, in the month of *Auguſt*. They are, I hear, more frequent in warmer Climates, tho very often undiſcover'd.

The reaſon I imagin to be this, when they are ſeiz'd with this violent Heat and Diſorder, which for the moſt part happens in the Night, they ſteal privately over-board into the Sea, imagining they're going into the green Fields. And this I take to be the reaſon we ſee ſo few, tho I have heard frequently in the *Mediterranean* in Summer time, and very hot Weather, of Seamen loſt in the night, which the Sailers took for granted were gone off upon ſuch like occaſions unobſerved. And I remember very well, this perſon was actually going over-board, when one of his Brethren, who ſuſpected his deſign, as he told me, caught hold of him juſt as he was going to leap off, call'd for help, and ſecur'd him by this Accident.

This Diſtemper, I am of opinion is what we call a *Phrenitis*, occaſioned by a more than ordinary Effervеſcence and heat of the Blood, which diſtracting and confounding, if not inflaming the Animal Spirits, the proper and immediate Miniſters of the mind, is the cauſe of all thoſe irregular motions, violent Exploſions and Convulſions. Hence 'tis the Animal Idea's are confus'd, the Imagination deprav'd, and all the rational Functions diſorder'd. From theſe Orgaſms in the Animal Spirits, we may, I fancy, give ſome account of the want of Pulſe too, their conſtant and impetuous Motions through the Fibres, not admitting any diſtinct Arterial Vibrations. And perhaps Phlebotomy did not ſucceed at firſt, becauſe the Orifices contracting preſently, prevented its Effuſion, and probably the thickneſs of the Blood concurr'd not a little in this Phænomenon. His calling out for the green Fields, the true Criterion of this Diſeaſe, I take to be from the violent heat he was then in, which made him fancy green Fields and open Air to cool himſelf in at that time, the Ship being too warm for him under theſe Circumſtances, for want of Air. And laſtly, Calentures happen oftner by Night than by day, becauſe our Ships are moſt cloſely ſhut up by Night, and are leſs airy than they are in the day time.

II. Carigueya,

II. CARIGUEYA,

Seu Marſupiale Americanum Maſculum.

Or,

The Anatomy *of a* Male Opoſſum : *In a Letter to Dr* Edward Tyſon, *from Mr* William Cowper, *Chirurgeon, and Fellow of the Royal Society,* London.

To which are premiſed ſome further Obſervations on the Opoſſum ; *and a New* Diviſion *of Terreſtrial Brute Animals, particularly of thoſe that have their* Feet *formed like* Hands. *Where an account is given of ſome Animals not yet deſcribed. By* Edward Tyſon, M. D. *Fellow of the College of Phyſicians and of the Royal Society.*

HAving formerly given the *Anatomy* of a *Female Opoſſum*; for compleating the Hiſtory of this Animal, I intended likewiſe to add that of the *Male*. And tho indeed I had an opportunity of doing it much ſooner, by the favour of *Arthur Bayly*, Eſq; a Merchant here in *London*, who preſented me with two: Yet I am well pleaſed to find my ſelf prevented herein by a Friend, whoſe great Skill in *Diſſecting*, as well as *Deſigning* the Parts to be repreſented, renders him altogether fit for ſuch an Undertaking, I ſhall refer the Reader therefore to the Account Mr *Cowper* has drawn up and ſent me, of the inward parts of the *Male Opoſſum* : And ſhall only beg leave to obſerve ſome few things, that may tend to the illuſtrating the Hiſtory of this *Animal*, omitted in the Anatomy of the *Female Opoſſum*, printed in the *Philoſophical Tranſactions* No 239. for the Month of *April* 1698.

And in the firſt place, whereas pag. 107. I queried to what *Species* in the Prædicament of Animals this Creature might properly be reduced? Now having upon diſſection obſerved the *Penis* to be fleſhy, and to have no *Bone* in it; I find it cannot be referred to the *Dog* or *Weaſel* kind, as ſome have thought; and what *Piſo* means by his *Glires majores montani*, to which he refers it, I ſhall not here enquire. I muſt confeſs we cannot be at a certainty in this matter, unleſs we had a more perfect Enumeration and Deſcription of the ſeveral ſorts of Animals that are in the World; and by a ſtrict Enquiry into their *inward* as well as *outward* Parts, obſerved, how gradually they differ from one another; by eaſie and gentle ſteps, the intermediate *Species* linking the whole together. However till this can be attained, every little help will contribute ſomewhat.

To give therefore my Thoughts on this ſubject, I ſhall here propoſe a *Diviſion* of ſuch *Terreſtrial Animals*, as have many *divided Claws* and *Nails* at the end of them into

Animalia

Χειρο-δάκτυλα *ſeu Manu-digitata, i. e.* whoſe *Feet* reſemble *Hands*, and have *Fingers* rather than *Toes*.

Ποδο-δάκτυλα *ſeu Pede digitata*, i. e. whoſe *digiti*, from the order of their Poſition and Shortneſs, as alſo Uſes, more reſemble *Toes* than *Fingers*.

For tho our Language makes a ſufficient diſtinction between them, by calling one *Fingers*, the other *Toes*; yet the *Greek* and *Latin* do not; for δάκτυλοι and *Digiti* ſignifie thoſe on the *Hand*, and *Feet* likewiſe. To diſcriminate them therefore they are obliged to add another word, as *Digitus Manûs*, or *Digitus Pedis*; which ſufficiently juſtifie our Diſtinction of Χειροδάκτυλα and Ποδοδάκτυλα.

Now we may obſerve theſe Differences between the *Fingers* and *Toes*, *viz.* that the *Fingers* are much longer, having uſually a *Thumb* ſet at a diſtance from the Range of the other Fingers; and are ſo contrived, for the better holding what they have a mind to, and eſpecially in theſe Animals, to aſſiſt them in *climbing* Trees, *&c.* for catching their Prey. Whereas the *Toes* are ſhorter, and are ſet in a more even range together, and better contrived for ſwift *running*, by which way this other ſort of Animals take their Prey.

This latter ſort we ſhall not inſiſt on here, but rather give a *Subdiviſion* of the former, *viz.* thoſe Animals which have their *Feet* formed like *Hands*. Now where there is a *Thumb*, tho we may eſteem the *Hand* there more perfect, yet I find 'tis not always neceſſary; for in ſeveral Animals 'tis wanting, as will appear by the following *Scheme*; which I propoſe here only as an Eſſay or Hint, by farther Obſervations to be inlarged and amended, rather than as one juſtly adapted and compleat; for I doubt not but there are ſeveral Animals not here mentioned, that may be reduced under ſome of theſe Heads; and there may be ſome here ſpecified, upon ſecond Thoughts may be more fitly ranged otherwiſe. However at preſent let this ſerve.

Animalia χειρο-δάκτυλα, *Quorum*

Pedes
- *omnes ſunt Manu-formes, ſeu Animalia Quadru-mana.*
  - *cum* Pollice *in* Omni Pede *ſc.*
    - Simia
      - *Caudata.*
      - *Non Caudata.*
    - Romack.
    - Coati *Braſil.*
    - *&c.*
  - *Sine Pollice in Pedibus.*
    - *Anterioribus*
      - Vantrevan.
      - Sciurus.
      - Mus, *&c.*
    - *Poſterioribus.*
      - *Genus Felinum.*
- *Duo tantùm ſunt Manu-formes. ſc. vel*
  - *Anteriores*
    - *Cum Pollice*
      - Mantegar,
      - *&c.*
    - *Sine Pollice.*
      - Cuandu *Braſil. Margravii.*
      - Tlaquatzin *Spinoſum Hernandez.*
      - Hyſtrix.
      - Tamandua *Braſil.*
      - *&c.*
  - *Poſteriores.*
    - *Cum Pollice*
      - Carigueya. *S. Opoſſum,*
      - *&c.*
    - *Sine Pollice.*

Under the firſt Member of this Diviſion I include the *Ape* and *Monkey* kind, which as I have ſhown in my Diſcourſe of the *Ourang Outang*, ought rather to be reckoned a *four handed* than a *four footed* Animal. And conſidering how large a *Species* of Animals may be reduced under this *Quadrumanous* kind, agreeing in this particular, tho in others different, I think it but juſt to aſſign them a General *Claſſis*, afterwards to be ſubdivided according to the gradual differences they have from one another.

The *Romack* therefore, tho in the Head and Face much different from the *Monkey* kind, yet being *Quadrumanous*, and on each *Hand* having a *Thumb*, I reduce under this Head. This Animal was brought alive from *Fort St George*. Whether it is deſcribed by any, or what other Names 'tis call'd by, I do not know. Hereafter it may be I may give a deſcription of this and ſome others of the *Ape* and *Monkey* kind, in an *Appendix* to my diſcourſe of the *Ourang Outang*. And becauſe in its face and head it ſo much reſembles a *Fox*, and in the reſt of its Body a *Monkey*, for the preſent ſhall call it Ἀλωπη-Πίθηκος, *Vulpi-Simia*, or the *Fox Monkey*. But the next I have mentioned in this Claſs, the *Coati* of *Braſil* and *Virginia*, or the *Rackoon* or *Rattoon*, tho in its Body it does not reſemble the *Monkey* kind, yet becauſe it has hands like a Monkey, as *Margrave* tells us, I place likewiſe here; as may be all others, whoſe *Feet* are all formed like *Hands*, and have a *Thumb* in each.

For there are ſome that have not a *Thumb* on their *fore feet*, and others that want one on the *hinder*.

In the number of the former may be reckoned the *Vantrevan*, the *Squirrel* kind and *Mouſe* kind, or any others that may be obſerved to have all their *Feet* formed like *Hands*, only on their *fore Feet* do want a *Thumb*.

The *Vantrevan* (as 'twas called by the Perſon that ſhewed it here in *London*) altogether reſembles a *Monkey*, which on the *fore Feet* had only 4 long *Fingers* and no *Thumb*.

'Tis a beautiful Creature, very briſk and nimble in motion and loving; has a very long *Tail*, by which it ſuſpends its Body, as does the *Opoſſum*.

The *Squirrel* kind on the *fore Feet* have 4 long Fingers, on the *hinder* five, and one like a *Thumb*. It makes uſe of its *fore Feet* like *Hands*, in holding up its Food to its Mouth, and lives on Trees, as do the *Monkeys*. But the affinity between the *Monkey* and *Squirrel* kind does better appear by ſome *Monkeys* I have ſeen, which on the *Belly* have a large thick Furr, and a thick bruſhy *Tail* like the *Squirrel*, whereas uſually on the Belly the *Ape* and *Monkey* are thinner of Hair, and that on their Tail is ſhorter. This ſort of *Monkey* I call therefore the *Squirrel Monkey* or *Sciuro Pithecus*, and have made a figure of one of them. But its *Face* more reſembled a *Man's* or an *Ape's*, as likewiſe its *Teeth*, and in theſe reſpects is much different from the *Squirrel* kind.

Nearer to the *Squirrel* comes the *Mouſe* kind, which in the ſhape of its *Head*, the long *Teeth* before, and the large and prominent *Eyes*, more reſembles the *Squirrel* kind, and makes uſe of its *fore Feet*, as *Hands*, in feeding its ſelf, where it has only 4 *Fingers* without a *Thumb*, but on its *hinder* has 5, of which the inwardmoſt and outwardmoſt are placed at a diſtance from the Range of the 3 middle *Fingers*, like 2 *Thumbs*, as may be obſerved in ſome of the *Lizzard* kind.

Why we ſhould include the *Cat* kind in the number of the *Animalia* χειρο-δάκτυλα ſome may queſtion, ſince their *Feet* ſeem rounder, and to have rather *Toes*, than *Fingers*. But we may obſerve that it uſes its *fore Feet* like *Hands* in climbing and catching its Prey; and when it does ſo, it exerts its *Claws* and lengthens them; but when it uſes its *Feet* in going and running, it ſhortens them, that being moſt convenient for that purpoſe, ſo that 'tis well provided for both, and its *Digiti* are of a middle nature between *Fingers* and *Toes*, as they are lengthened or ſhortned. And we may obſerve on each *fore Foot* there is a *Pollux* or *Thumb* ſet at a diſtance from the range of the other *Claws*, whereby they more reſemble *Hands*, and on the *hinder Feet* there are only 4 *Digiti* without a *Thumb.*

We come next to thoſe Animals that have only two *Feet* formed like *Hands*, and thoſe are either the *Fore-feet*, or the *Hinder.*

Thoſe whoſe *Fore-feet* only are formed like *Hands*, have either a *Thumb* there, as the *Mantegar*, *&c.* or have only four *Fingers*, without a *Thumb*, as the *Cuandu*, *&c.*

The *Mantegar* is an Animal not deſcribed as I know of by any Author, and the ſtrangeſt that I have ſeen. It is about the bigneſs of a Maſtiff Dog; it meaſured from the end of its *Noſe* to the *Anus* 3 foot 2 inches; the Girth of the *Body* 2 foot 2 inches; the *Head* 14 inches long; the *Forehead* 5 Inches broad; the *Head* ſomewhat reſembling an Horſe's; the *Noſtrils* large; the *Noſe* of a deep *Cinnabar* Colour, and the *Bones* of the *Noſe* depreſſed lower than thoſe of the *Upper Jaw*, where the *Skin* was of an *Azure* blew Colour; a large Tuft of Hair on the Forehead and likewiſe under the Chin; the forepart of the Body and inſide of the Arms and Legs almoſt bare of hair, the Hair on the outſide of them, of a mottle brown and Olive colour; on the Back blackiſh: There were *Mammæ* on the Breaſt; an *Umbilicus*; and the *Præputium* without a *Frænum*, as in the *Ape* kind; the *Præputium* of a *Vermilion* Colour; the *Scrotum* of an *Azure*; it had no *Tail*; 'tis very fierce, having 2 long *Tusks* in the Upper Jaw, and very laſcivious; the *Fore-feet* perfectly reſemble *Hands*, having long and thick *Fingers*, and a *Thumb*, and all the *Nails* of thoſe Fingers *flat*; the *Nails* on the hinder Toes and Fingers *imbricated*, not flat; and tho the *Claws* were pretty long, and ſomewhat imitating Fingers, yet the *Thumb* not ſo perfect, and the whole different from the Fore feet. When ſitting and ſupporting its ſelf by a

Stick in one hand, being thus erect, and holding a Cup in the other, it would drink out of it, and not lap; its Food was chiefly Fruits. But of this more it may be another time.

Amongſt thoſe Animals whoſe *Fore-feet* are like *Hands* and have no *Thumb*, I reckon the *Porcupine* kind, as the *Cuandu* of *Braſil*, a ſort of *Porcupine* deſcribed by *Margrave* and *Jo. Nieuhoff* (*Voyages* pag. 18.) which on the *Fore-feet* hath but 4 Fingers on the *hinder* 5. Therefore, as *Margrave* obſerves, for want of a *Thumb*, it is but ſlow in climbing Trees; but the better to help himſelf, it twiſts its *Tail* about a Bough, to ſave its ſelf from falling. And much alike, if not the ſame, is the *Tlaquatzin Spinoſum* of *Hernandez*. So the Common *Porcupine*, before has 4 Fingers, behind 5. So the *Tamandua* of *Braſil* or *Ant-Bear*, before has but 4 Fingers, where the want of *length* in the *Fingers*, is ſupplyed by that of the *Nails*, and behind has 5 *Toes*. But I muſt confeſs there muſt be ſome Allowance made, for ranging this *Anomalous Animal* (as Mr *Ray* calls it) here. But becauſe he *climbs* Trees, and in doing this makes uſe of his *Tail*, as ſome others here mentioned do, I was willing to put him into the Croud. And, unleſs it can be otherwiſe better ranged, we may likewiſe ſhuffle in here the *Ai*, *Ignavus*, or *Sloth*, becauſe it *climbs*, and lives on Trees, and has a Head not unlike *an Ape*'s; and, as *Margrave* aſſures us, two *Teats* on the *Breaſt*, but on each *Foot* had but three *Claws*, with very long *Nails*, like the *Tamandua*, and its Feet being very narrow and thus defective in Toes, 'tis very ſlow in Motion.

Now to conclude this *Scheme*, Amongſt the Animals whoſe *hinder Feet* only are like *Hands*, is to be reckon'd the *Carigueya* or *Opoſſum*; which having deſcribed at large in the Anatomy of the *Female Opoſſum*, I ſhall not inſiſt farther on it here: and if there be any other Animals that have their *hinder* Feet formed like *Hands*, either with or without a *Thumb*; they may be reduced hither, my chief Deſign in this *Scheme* being (as near as I could) to include all thoſe Animals that are obſerved to *climb* or live on *Trees*, into a Claſs together; and they being obſerved to have their *Claws*, either all or many of them, formed like *Fingers*, I place them therefore under this general *Title* of *Animalia* χειροδακτυλᾶ.

Now, begging pardon for this Digreſſion, we ſhall proceed in our Obſervations on the Male *Opoſſum*, omitted in the account given of the *Female*, and here we ſhall be brief.

Therefore pag. 112. in deſcribing the *Ears*, I had not an opportunity of obſerving that *white Rimm* that Incircles them, which is very beautiful: for when in Health, for the breadth of two lines or more, there runs an *Edging* round the Verge of the *Ear* of a perfect *Milk white* Colour. But the *Ear* here being ſo very thin and tender, 'tis eaſily affected by cold or illneſs, and then this white part becomes jagged and crimpled, as if burnt up, and the whiteneſs diſappears; as it happened in this laſt ſubject before its death, as well as the firſt, which occaſioned my not obſerving it then. 'Tis on this account that *Margrave* in his Deſcription of the *Tai-ibi* of *Braſile*, which now I take to be the *Male Opoſſum*, ſaith, it has *Aures ſubrotandas*, *molles*, *graciles albas*, *teneras ut Charta molles*, not that the whole *Ear* was *White*, but only the *Edges*.

But what I was moſt deſirous to know, was whether the *Male* had that *Marſupium* or *Pouch* for receiving the Young, as is affirmed by ſome I have named *pag.* 124. Mr *Cowper* in the Subject he diſſected, neither obſerved the *Pouch* nor the *Muſcles* belonging to it, as has been deſcribed in the *Female*: Nor indeed did I in that I diſſected. Only this I took notice of when firſt I had it; that the *Skin* here ſeemed to be looſer; ſo that with my finger I could eaſily thruſt it in, and by turning it round, could form for the preſent a *Pouch*; but this would eaſily turn out again, upon withdrawing my fingers. Whether therefore 'tis capable of being formed into a *Pouch* or *Marſupium* upon occaſion, I ſhall leave as a Quæry to be reſolved by thoſe that live where they breed, Whether they ever obſerve the *Male* to receive the *Young* ones as do the *Females*?

However, in the *Male* there were thoſe Bones I call *Marſupialia*, and I obſerved Muſcles running from them to the hinder Legs, which, no doubt, are very ſerviceable to them in drawing up their Bodies, as I find Mr *Cowper* has likewiſe remarked.

I ſhall further add, to confirm what *Oppian* and others I have named (pag. 126.) write concerning *Fiſhes* receiving their Young ones into their Bellies; that Mr *Herbert* in his Travels (*Lib.* 1. *Pag.* 23.) ſaith, that in their Voyage, they took a *Shark*, 9 foot and a half long; and found in her *Paunch* 55 young ones, each a Geometrical foot in length; *all which*, he adds, *go out and in at pleaſure.*

I ſhall conclude this Paper with ſome few remarks I made upon the *Brain*, ſince in the *Female* I had not an opportunity of doing it, and I find Mr *Cowper* has omitted it in the *Male*; but for all the reſt, ſhall refer to his account. Wherein the Reader will find that the *Organs* of *Generation* in the *Male* are no leſs ſurprizing and remarkable than in the *Female*; and in both they are different from any other Animal that I have met with.

Now as to the *Brain*, I obſerved that being taken out of the *Cranium* it weighed two drams two ſcruples. I did not find either in the *Cerebrum*, thoſe *Anfractus*; or in the *Cerebellum* thoſe *Circilli* which we uſually meet with in other *Brains*. The whole was of an Oblong figure, and ſeemed to be divided into three Parts, *i. e.* The *Cerebellum*, the *Cerebrum*, and that part of the *Cerebrum* which was projected into the *Roſtrum*. For by the Pinching in of the *Cranium* here, the fore part of the *Cerebrum*, from whence iſſued the *Proceſſus Mamillores* and *Olfactory*

Nerves, was by this Conſtriction, remarkably diſtinguiſhed from the *Cerebrum*; like an *Anterior* Brain. In the *Vermin* kind, and thoſe that have a long *Roſtrum*, I have obſerved the like. For Nature here ſeems to give them more particularly the advantage of the *Senſe* of *Smelling*, for finding out their Prey, or avoiding the Danger they would ſhun.

So likewiſe I obſerved the *Optick Nerve*, as likewiſe the *Eye* to be large; the better to look out for the one, or the other. And when I have mentioned the *Auditory* Nerves to be large likewiſe for the ſame reaſon, to give them a quick ſenſe of hearing any ſudden Noiſe, and ſo to avoid the Danger, theſe were the greateſt Remarks I made upon the *Nerves*.

It was obſerved that it ſaw beſt in the twilight, and not ſo well in the bright Sun; which I was eaſily brought to believe, becauſe it was then to ſeek out for its Prey.

In the Eye I obſerved the *Membrana Nictitans*; The *Glandula Lachrymalis* was large and oblong; there was the *Muſculus ſeptimus ſuſpenſorius*; and the *Cryſtalline* Humour was large, very tranſparent, and almoſt of a globular figure; the Eye or *Iris* black.

II. *A Letter to Dr* Edward Tyſon.

Giving an Account of the Anatomy of thoſe parts of a Male Opoſſum *that differ from the Female. By* William Cowper, *F. R. S.*

S I R,

HAd your Account of the *Female Opoſſum* been leſs Accurate, I ſhould not have been tempted to look farther than the Parts that diſtinguiſh the Sexes; for on comparing your Deſcription of the Organs common to both, it was ſufficiently evident how little can be added, tho you had but one Subject to examine.

The ſingular contrivances of that Animals Organs renders the Anatomy of them very deſirable, I may ſay entertaining, to thoſe who have Taſtes for ſuch enquiries.

Comparative Anatomy (as inſtructive as it is) does not eſcape the Cenſure of the Vulgar; tho you know the greateſt Illuſtrations of the uſe of Parts are not only to be had from thence, but the very exiſtence of divers Organs in Human Bodies have been made known to us by Diſcoveries firſt made in the Bodies of Quadrupeds. The Circulation of the Bloud, and the Paſſages for the Chyle and *Lympha*, had been as little known to us as our Predeceſſors, were it not for Diſſections made on the Bodies of ſeveral Animals. But I ſhall no more abuſe your Patience with theſe kind of Apologies, than I would omit owning an obligation incumbent on me, (which is) to beg your pardon for making an attempt, where you have given ſuch inſtances of your great Ability.

This *Male Opoſſum*, as the *Female* you diſſected, was brought from *Virginia* and preſented to the *Royal Society*, by the ſame Benefactor, *William Bird* Eſq; and was alſo kept alive in their Repoſitory; but falling from its meat (like that you examin'd, I gueſs) it languiſhed and dyed: The cauſe of its Death appeared to be from a Mortification of the *Duodenum* immediately below the *Pylorus*, which ſeemed to ariſe from a quantity of Hay, that had been collected in the Stomach, and matted together in the ſhape you have deſcribed, and figured the *hairy *Tophus* you found in the Stomach of that you diſſected, but I could not find any hair in this; this wod of Hay ſlipping out of the Stomach ſtuck in the *Duodenum*, which together with the viſcid matter that involved it, compleatly obſtructed the Paſſage in that Gut, as well as that of the Gall into the Gut, which appeared from the Diſtention of the Liver as well as fullneſs of the Gall Bladder. The *Omentum*, which in this Creature is only faſtned to the bottom of the Stomach, had alſo ſuffered a *Gangrene*, as had almoſt the whole Canal of the Guts: but of this by the by, my deſign being only to give you an account (ſuch as it is) of thoſe Parts of the *Male*, which diſtinguiſh it from the *Female*.

* Phil. Tranſ. N. 239. Tab. 2. Fig. 4.

Beſides the Organs imploy'd in Generation, the *Male Opoſſum* differs externally from the *Female*, there being no *Marſupium* or Pouch to receive the young ones, which you have given ſo exact a deſcription of; nor are there any Muſcles inſerted to the Skin of the *Abdomen* ſpringing from the *Oſſa Marſupialia*, as you call the Bones, which may deſerve the Name of *Hyoides*, from the figure they make with the *Oſſa Pubis* of this Animal; which Bones do not ſeem to differ in the *Male*, from thoſe of the *Female* you have deſcribed and figured in the Tranſactions abovementioned.

There is no external appearance of Genitals in the Fig. Male Opoſſum* but the *Scrotum*; which, is but juſt big enough to contain the *Teſtes*; nor could I readily diſcover any other *Foramen* outwardly in theſe parts but the *Anus*, *Fig.* 1. A. which leads to the *Rectum*; but on withdrawing its ſides, I found another *Foramen*, B. which on Diſſection appeared to be the *Præputium* or Out-let of the *Penis*. On compreſſing the parts on each ſide this *Cloaca*, A. B. I obſerved two Drops of yellowiſh colour'd Liquor (of the reſemblance of *Pus*) ſtart out on each ſide the *Anus*, c c. which on further examination I found come from two glandulous Bodies or Bags placed on the *Sphincter Muſcle* of this Part. This ſort of Liquor (it ſeems) you found in the Pouch of the *Female*, which, like this, had more of the peculiar *Fœtor* of this Animal, than any other part beſides; for on removing theſe Parts with the Skin about the *Cloaca*, I was freed from the ungrateful Smell of it. On ſeparating the Skin from the Muſcles of the *Abdomen*, the two above-mentioned Bones (peculiar, I believe, to this Animal) appeared, from whence ſome Muſcles ſprang, and were inſerted to the *Oſſa Femorum*, which performed the Office of the *Pſoas* Muſcles in other Animals, which laſt named Muſcles were much ſmaller in this than in other Creatures.

The *Abdominal Muſcles* were alſo faſtned to the laſt mentioned Bones, particularly the *Recti*, which enabled this Creature to project or ſpring its Body, eſpecially in pulling its hind Legs forward, with more advantage or force than other Animals, which are without theſe Bones.

Immediately under the Skin about the *Cloaca*, I found a thin fleſhy Muſcle, incloſing the *Præputium*, and lower parts of the *Rectum* and *Odoriferous Bags*, together with the *Fig.* 2, 3. four *Mucous Glands*, M M N N. at the roof of the *Penis*, and body of the *Penis* it ſelf A; all which parts were liable to be compreſt by the Action of this Muſcle, eſpecially when the *Penis* is erected, whereby its Erection is ſuſtained, by compreſſing the two external Veins on the *Dorſum Penis*, of which more hereafter, when I come to ſpeak of the manner the *Penis* of this Animal is erected. On removing this thin broad *Sphincter Muſcle*, I was obliged to clear away two Lumps of hard Fat before the Body of the *Penis* could be diſcovered; but we ſhall leave theſe Parts till we have cleared the *Teſtes.*

The *Scrotum* being remov'd, each Teſticle appear'd as repreſented on the left ſide Q T V. the *Vaſa præparantia* Fig. 2. and *Deferentia* Q Q being incloſed in the *Cremaſter* Muſcles P P. Theſe Muſcles were proportionably very large in this Animal, as I have always obſerv'd them in Creatures, that have no *Veſiculæ Seminales*, which is the Caſe of this Animal, and this Proviſion of Nature ſeeems not only neceſſary to ſuſpend the *Teſtes*, but theſe incloſing *Cremaſter* Muſcles, alſo compreſs the *Epididymides* and *Vaſa Deferentia*, and oblige them to diſpatch their Contents (the *Semen*) into the *Urethra* in the time of the *Coition*, which otherwiſe would have a ſlow progreſs; but this contrivance appears more peculiarly requiſite in this Creature, becauſe the defect of the *Veſiculæ Seminales* here, ſeem to be ſupplyed by the largeneſs of the *Epididymedes* of the *Teſtes* W W Fig. 2, 3. which you know are the excretory Ducts of the *Teſtes*, and appear in this Animal to have a larger Bore than ordinary: For this reaſon the *Tunicæ Vaginales* are very ſtreight in this Animal, as appears in the Figure T V R R. Fig. 2.

On diſcovering the Originations of the Spermatick Arteries, I was ſurpriz'd to meet with an appearance I never heard of nor obſerved before; and in this I ſhould not have had any ſatisfaction, if I had not firſt injected Wax into the Trunks of the great *Artery* i i i, and *Vena Cava* h Fig. 2. below the *Diaphragm.* It ſeems the deſcending Trunk of the great Artery, below the emulgent Arteries in this Creature, is placed directly under the Trunk of the *Vena Cava*, nor does the Iliack Branches of the Arteries here, twine about thoſe of the Veins, as in Human Bodies and ſome Quadrupeds, which is done perhaps to compreſs the Chanels of the Veins, by means of the Pulſation of theſe Ar-

Arteries to drive up the Blood in the Veins towards the Heart ; but that contrivance ſeems no way neceſſary in this Animal, becauſe the contrary poſition of its Body is more cuſtomary in hanging by its Tail with its Head downwards : It is not unlikely, if the Veins of this Animal were examined below the Heart (which indeed I did not think of till thoſe Parts were thrown away) but we ſhould meet with ſome Contrivance to prevent the Precipitate Flux of the Bloud in that Pendulous Poſition, as I have obſerv'd in the Trunk of the *Cava* immediately above the Liver in Dogs. But to return to the Spermatick Veſſels.

The Arteries a a ariſe from the forepart of the Deſcending Trunk of the Great Artery, and paſs through a very ſmall Perforation * ...... made on purpoſe in the *Vena Cava*, and deſcend ſtraight to the *Teſtes*, as in Human Bodies, and are not contorted in their progreſs, as we find them in moſt , if not all Quadrupeds. This Perforation of the *Cava* perhaps was not only made for tranſmitting the Spermatick Arteries, but may alſo frame an *Anulus*, that may check the velocity the Bloud would otherwiſe have in thoſe Arteries, which rapid Motion of the Bloud we find Nature ſtudiouſly avoids in the *Teſtes* of all Animals : For in Men we ſee theſe Spermatick Arteries (contrary to all other Trunks of Arteries) are leſs at their Originations from the Great Artery ; and in Quadrupeds (except in this) the Spermatick Arteries are contorted before they reach the *Teſtes*, as I have (*a*) elſewhere taken notice. The Spermatick Veins, after leaving the *Teſtes* of this Animal (like thoſe of Humane Bodies) have ſeveral Diviſions and Inoſculations, which are all reduced to one Trunk on each ſide, and empty themſelves into the *Cava* immediately above the Perforation b b.

Fig. 2.

Fig. 2.

Had the known Structure of the *Teſtes*, in relation to their Excretory ducts been left undiſcovered till now, the bare inſpection of thoſe parts in this Animal would inſtruct

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(a) Phil. Tranſ. No 280. Pag. 1180.

Inſtrnct us: for on dividing the *Tunica Vaginalis* (R R) Fig. 2, 3. I found the incloſed Teſticle and its *Epididymis* lying looſe, inſomuch that they parted from each other as expreſt W X Y Z, and with the aſſiſtance of a pretty large Convex Glaſs I could ſee the *Excretory Duct* Z ariſing from one end of the Teſticle, where the Spermatick Artery and Vein Y may be ſeen: After that Duct has marcht a little way it may be ſeen folded up into the Body call'd *Epididymis* W W. and at length makes the *Vas Deferens* S S. You know in Men, and moſt, if not all Quadrupeds, the *Epididymides* and *Teſticles* cleave ſo to each other, that without ſome Dexterity in Diſſection the riſe of them from the *Teſtes* is not to be diſcovered. This proves to Us the Uſe of *Comparative Anatomy* in detecting the Structure of parts which is very Obſcure in other Subjects as well as in Humane Bodies; but to return to the *Vaſa Deferentia*, S S. after they leave the Fig. 1. *Præparantia* a b, as in Men and other Creatures, they grow ſomewhat larger, but on croſſing the *Ureters* e e become leſs again at their Entrance into the *Urethra*, immediately below the Neck of the Bladder; where their Orifices could be perceived on each ſide a *Caruncle*: Nor are there any *Veſiculæ Seminales* near the *Vaſa Deferentia* of this Animal, as in Boars, Bulls, Horſes, *&c.* which nevertheleſs cannot be allowed to communicate with each other as in Men; for tho the *Vaſa Deferentia* and *Veſiculæ Seminales* of thoſe laſt named Animals empty themſelves into the *Urethra* at the ſame Orifices with the *Veſiculæ Seminales*, yet their Communicant Ducts are ſo very ſhort, that whatever comes by the *Vaſa Deferentia* will ſooner eſcape into the *Urethra*, than be received by the *Veſiculæ*, as in Men.

The length of the *Urethra* between the Bladder and the *Penis* exceeded four Inches, more than three Inches and an half of which was incloſed with a Glandulous Body, Analogous to the *Proſtates* in Men and other Crea-

tures;

tures; the Orifices of the Secretory Ducts of this Glandulous Body are very numerous, and open into the *Urethra* on all ſides, as appeared on opening the *Urethra*, and compreſſing this Glandulous Body or *Proſtatæ*, I ſaw its Secreted Juice ſtart out.

Fig. 2, 3. This part of the *Urethra* I K K L thus incloſed with the *Proſtates*, being very much contorted or folded, in its Natural Situation between the Bladder and the *Penis*, when there is no Erection, muſt neceſſarily be drawn out, and becomes ſtraight when the *Penis* is Extruded, (which I ſhall ſhew by and by happens upon an Erection) by which means this Glandulous Body is neceſſarily compreſt, and the *Succus Proſtatarum* forced into the *Urethra*. The *Proſtatæ* of divers Animals are compreſt by Muſcles fram'd on purpoſe that incloſe them, as in Boars, Rams, *&c.* in Men they are compreſt by the *Muſculi Levatores Ani*.

At the root of the *Penis* of the *Opoſſum* we meet with four Glandulous *Veſiculæ* M M N N two on each ſide, which empty themſelves into the *Urethra*, and contain a Mucous matter, like that I find in the Glands I lately diſcover'd in this part in Men. Theſe *Veſiculæ* are not only compreſt by the thin broad Sphincter Muſcle above mentioned, but the Bulbs of the Cavernous Bodies of the *Penis* CC, and *Urethra* E E, when diſtended (in the Erection of the *Penis*) alſo compreſs theſe mucous Bags. This compreſſion is effected in Men by the Intumeſcence of the Bulb of the Cavernous Body of the *Urethra* *. In Boars, Rams, Cats, *&c.* we find Nature ſo ſollicitous to diſcharge the contents of the Excretory Ducts of theſe Glands, that (like the Gizard of Birds) each Mucous Gland is incloſed with a proper Muſcle to compreſs it.

* Phil. Tranſ. No 258. Pag. 365.

The *Penis* fell next under my Examination, the Fabrick of which appears not leſs ſurprizing, than that you met with in the *Uterus* of the *Female*; and in many circumſtances differ'd from what I have found in all the Animals that I have hitherto diſſected: Beſides the Forked *Glans* of its *Penis*, B B. its Cavernous Bodies D D had Fig. 2, 3. no Connection with the *Oſſa Pubis*, nor did the Muſcles call'd *Erectores* or *Directores* C C cleave to any Bone as in Men and Quadrupeds, but all thoſe parts lay looſe under the *Oſſa Pubis*. The other extremities of the two *Corpora Cavernoſa Penis* are received into the Glans. Nor did the *Corpus Cavernoſum Urethræ* e or its Muſcles E E cleave to the *Sphincter Ani*, as in moſt Fig. 3. other Creatures, but the whole body of the *Penis* lay looſe between the bones of the *Pubis* and the *Rectum*, ſo that on the Intumeſcence or Erection of the *Penis*, it is at liberty to be extruded from its *Præputium*, wherein it is ſecured from outward injuries when not erected. To favour this Extruſion of the *Penis* in this Animal, the *Urethra* I K L is not only very long between it and the Fig. 2. Bladder O O, but I found it much more contorted or folded in acuter Angles, than is expreſt in the Figures, elſe the *Penis* could not be extruded, but the Bladder O O muſt follow it. Beſides it appears, Nature deſign'd this extruſion of the *Penis* of this Animal in its Erection, becauſe we meet with Inſtruments to withdraw it again into the *Præputium*. f f G ſhews a pair of Muſcles elegantly framed for that purpoſe on the fore part of the *Penis*; they ariſe fleſhy from the *Corpora Cavernoſa Penis* D D, and becoming tendinous f f, as they paſs through two Ligaments or Pulleys on the *Oſſa Pubis*, and are afterwards united into one Tendon G, which is inſerted to the upper part or *Dorſum Penis*. Beſides this pair of Muſcles (which is peculiar perhaps to this Animal) I found another pair of Muſcles H H, that alſo withdraw the *Penis* ariſing from the Fig. 2, 3. *Rectum*, and are inſerted to the extremities of the *Corpora Cavernoſa Penis*: In Cats, Male Porpeſs, Bulls, Rams and Boars, we meet with two Ligaments ſpringing from the *Os Sacrum* or *Ilium* on each ſide, and inſerted to the *Corpora Cavernoſa Penis* of thoſe Animals, which like theſe Muſcles ſerve to withdraw the *Penis* of thoſe Creatures into the *Præputium.*

Fig. 2, 3. The *Corpora Cavernoſa Penis* of the *Opoſſum* differ in their figure from what we find in other Creatures; their upper parts are bulbous D D, and covered with Muſcles C C like the Bulb of the Cavernous Body of the *Urethra* in Men: In other Animals, thoſe parts of the *Corpora Cavernoſa Penis* are of a Conical figure. The Muſcles of the Cavernous Bodies of the *Penis* of this Creature having no connection with the *Os Pubis*, cannot apply the *Dorſum Penis* to the laſt nam'd bone, and compreſs the Vein of the *Penis*, whereby to retard the Refluent Bloud, and cauſe an Erection, as we have obſerved in other Creatures; but ſome large Veins of the *Penis* here, take a different Courſe and Paſs through the middle parts of the Bulb Fig. 4. K K C, and are only liable to the Compreſſion made by the Intumeſcence of theſe Muſcles C C, that incloſe them.

Fig. 2. But the chief Agent in continuing the Erection of the *Penis* in this Animal, is the *Sphincter* Muſcle of its *Anus*, or rather *Cloaca*, to which the broad *Sphincter Muſcle* above-mentioned is continued, and does ſomewhat contribute. When the *Penis* is extruded from the *Cloaca* (which muſt happen when it is erected) the *Sphincter* of that part neceſſarily embraces it, the like muſt be done by the *Sphincter Muſcle* of the *Cloaca* of the *Female* in Coition: On theſe accounts I am apt to think, theſe Creatures are not very quick in that Act. Beſides the figure of the *Penis*, Fig. 4. ſhews an unfitneſs for its retraction till there is a Detumeſcence of its *Glans* A B, which perhaps does not happen in theſe Creatures till both *Male* and *Female* are ſatiated, as in Dogs and other Animals that have Bones in their *Penis*, and have a *bulbous* Intumeſcence of the *Glans* in Coition, and no *Veſiculæ Seminales* as in this Animal, and alſo impregnate the *Female* with more than 2 or 3 at a time, as this does.

As the *Bulb* of the Cavernous Body of the *Urethra* in Man, is fram'd for the uſe of the *Glans*, to keep it ſufficiently diſtended when required, ſo it ſeems it is neceſſary to have two of thoſe *Bulbs* incloſed with their particular Muſcles E E in this Animal to maintain the Turgeſcence of its doubled or forked *Glans* A B when the *Penis* is erected: In this diſtention of this *Glans Penis* of this Creature, the middle part of the Orifice of the *Urethra* (in which you ſee the Probe paſſing out of Fig 3. is neceſſarily compreſt, as repreſented Fig 4. D and two diſtinct Apertures C C are left, as appears by the laſt mentioned Fig. 4. A B on each ſide its forked *Glans*.

Fig. 2.
Fig. 4.

They that fancy an *Aura Seminalis* of the Male, paſſes by the way of the Bloud of the Female to their *Ovaria* to fæcundate the *Ova*, will here meet with an Inſtance I muſt leave them to ſolve. For to what end has Nature been at the trouble of making double Emiſſaries for the *Semen* of the Male *Opoſſum*, tho ſhe deſign'd the Impregnation of a double *Uterus* of the Female? Certainly one paſſage in the *Glans Penis* would have been ſufficient to convey the *Semen Maſculinum* to the Maſs of Bloud of the *Female* in the manner they conceive. Nature would never have been at the trouble of all this Clutter in this Animal, in making a double *Glans*, and contriving two diſtinct Apertures in the *Glans*, when its *Penis* is erected, if the Propagation of the Species had not depended on't: Doubtleſs 'twas for that end chiefly, that the *Penis* of this Animal differs ſo much from what we meet with in other Creatures. Nor could the *Penis* of this Animal in theſe Circumſtances, be expos'd in a *Præpuce*, as in other Quadrupeds, by reaſon of the numerous Accidents that would certainly attend it in this Animals way of living: Nor could its *Penis* been thus withdrawn, when not erected and ſufficiently extruded, when it is, if (as in other Creatures that are retromingent alſo) the *Penis* here had been faſtned to the *Oſſa Pubis*.

Thus, Sir, we ſee Nature in theſe Inſtances, as you muſt have frequently taken notice of in others, accompliſh the ſame ends by different Methods. Although there are no *Veſiculæ Seminales* in this Animals, as in Dogs, Weaſels, *&c.* yet we find its *Penis* without a Bone in it, as in thoſe Creatures; but then we meet here with additional Contrivances to maintain its Erection: Not only *Fig. 3.* the *Sphincter* Muſcle of the *Cloaca* of the *Male Opoſſum*, but that of the *Female* alſo cloſely embraces its *Penis* in Coition, and effectually retard the refluent Bloud from its *Fig. 4.* *Corpora Cavernoſa*, by compreſſing the Veins of the *Penis* E. Nor could the *Penis* of this Animals be fram'd like that in Boars, Rams, Bulls, *&c.* in whom the *Corpora Cavernoſa* are too large, when not erected, to be ſecured within the *Cloaca* of this Animal. If in this I have been tedious, it may be ſome excuſe, I had not time to make it ſhorter. Who am,

Your Obliged Humble Servant,

William Cowper.

The Explanation of the Figures.

Fig. 1.

SHews the external appearance of the Genitals of the *Male Opoſſum*, ſomewhat leſs than the Life.

A B c c. The *Anus* or *Cloaca*. A its lower part which leads to the *Rectum*. B its upper part or Orifice of the *Præputium*, whence the Urine and *Penis* is extruded. c c. Two ſmall Apertures, whence the yellowiſh colour'd Liquor, that had the peculiar *Fœtor* of the Animal, had its Exit.

D. The *Scrotum* juſt large enough to contain the *Teſtes.*

E. That part of the *Abdomen*, where the *Marſupium* is ſeen in the *Female*, which here appears a little more depreſt than in other Animals, but cannot retain the young ones, as does the Pouch of the *Female.*

F F. The two Thumbs of the hind Feet, or Hands.

Fig. 2.

The fore parts of the Organs of Generation diſſected from the *Male Opoſſum*; done as big as the Life.

A A. The Body of the *Penis.*

A B. The forked *Glans.*

C C. The Muſcles Analogous to the *Directores Penis* in Men and other Creatures, which here incloſe the *Bulbi* of the Cavernous Bodies of the *Penis.*

D D. The two *Corpora Cavernoſa Penis* before they joyn and make the Body of the *Penis.*

E E. Parts of the two Bulbs of the Cavernous Body of the *Urethra.*

G f f. A pair of Muſcles, whoſe two Tendons f f paſs through two Ligaments or Pulleys on the *Oſſa Pubis*, and are afterwards united into one Tendon G. inſerted to the *Dorſum Penis*, and ſerve to draw the *Penis* within the *Cloaca* after an Erection.

H H Two other Muſcles which ſerve for the ſame Uſe, and ariſe from the *Rectum*, but are fixt to the oppoſite part of the *Corpora Cavernoſa Penis.*

I. The *Urethra* where it has no Glandulous Body incloſing it.

K K. The *Proſtratæ* or *Corpus Glandoſum*, incloſing the *Urethra*, which lyes contorted between the *Penis* and Bladder of Urin in the *Pelvis* of the *Abdomen* of this Animal.

M N. Two Mucous bags on each ſide, at the root of the *Penis*, which empty themſelves into the *Urethra.*

O O. The Bladder of Urine.

P P. The *Muſculi Cremaſteres.*

Q Q. The left *Cremaſter* Muſcle incloſing the *Tunica Vaginalis*.

R R. The *Tunica Vaginalis* of the right ſide, opened to ſhew the incloſed *Vaſa Præparantia* and *Vas Deferens*.

S S. The *Vas Deferens*.

T V. The *Tunica Vaginalis* incloſing the left *Teſticle*, with its *Epididymis* V.

W X Y Z. The right Teſticle, as it appear'd on opening the *Tunica Vaginalis*.

W. Its *Epididymis*.

X. The Body of the Teſticle.

Y. The Spermatick Vein and Artery as they paſs to and from the Teſticle.

Z. The excretory Duct of the Teſticle, which could be diſtinctly ſeen ariſing from the *Teſtes* and marching to the *Epididymis* W where it is folded up and conſtitutes that Body, whence it is continu'd to the Bladder of Urin, and call'd *Vas Deferens* S S.

a a. The Spermatick Arteries ariſing from the fore part of the deſcending Trunk of the *Artera Magna*, where they have a common *Ductus*, which is divided as it paſſes through an Aperture * made on purpoſe in the Trunk of *Vena Cava*.

b b. The Spermatick Veins at their entrance into the *Cava*.

d d. The Kidneys.

e e. The Ureters.

g g. The Emulgent Veins.

Ψ Part of the left Emulgent Artery.

h. The *Vena Cava* below the Liver.

i i. The deſcending Trunk of the Great Artery.

k k. The Meſenterick Arteries.

l. The lower Meſenterick Artery, which in this Animal does not ariſe from the Great Trunk.

m. The left *Glandula Renalis*, that of the right ſide being placed behind the Trunk of the *Vena Cava* n.

o. A common Trunk of an Artery, from whence ſprings the Gaſtrick, the Superior and Inferior Meſenterick, and the Emulgent Arteries of this Animal. The deſign of Nature in confining all thoſe Arteries to one Trunk in this Animal, might be perhaps in favour of its uſual poſture in hanging by its Tail, with its head downwards. This Trunk of the Arteries of the *Viſcera* of the lower Belly, having ſo many united forces, is the leſs liable to any Compreſſion that might be made by the contain'd parts of the lower Belly in that Poſture.

Fig. 3.

The back ſide of the Genitals of the *Male Opoſſum.*

A. The Body of the *Penis.*

B. Its *Glans.*

C C. The *Bulbi* of the *Corpora Cavernoſa Penis* covered with their Muſcles.

D D. The *Corpora Cavernoſa Penis.*

E E . . . . The two diſtinct *Bulbs* of the Cavernous Body of the *Urethra*, incloſed with their particular Muſcles.

F F G. Parts of the Muſcles expreſt on the fore part of the *Penis* in the preceding figure.

H H. The other pair of Muſcles ſpringing from the *Rectum*, and inſerted to the ſides of the *Corpora Cavernoſa Penis.*

I K L. The *Urethra* covered with the *Proſtatæ* K L K.

M N. The two Mucous Bags on each ſide.

O. The Bladder of Urine.

P. The *Muſculus Cremaſter.*

Q. The *Tunica Vaginalis* open'd.

R. *Vaſa Præparantia* cut from the great Trunks.

S S. The *Vas Deferens* on each ſide.

W X Y Z. The left Teſticle, as in the preceding figure, with the oppoſite ſide here towards you.

e e Parts of the Ureters.

* * A Probe inſerted into part of the *Urethra.*

Fig. 4.

The fore part of the *Penis*, as it appears when its *Corpora Cavernoſa* are fill'd with Mercury and dry'd; figur'd as big as the Life.

A B. Its forked *Glans.*

C C .... The two diſtinct apertures that appear in this Diſtention or Erection of its *Corpora Cavernoſa.*

D .... The middle part of the Orifice of the *Urethra*, which is occluded on the Intumeſcence or Erection of the *Penis.*

E. .... The two Veins of the *Glans*, which are compreſt by the two *Sphincter Muſcles* of the *Male* and *Female* in Coition.

F. The Bulbs of one of the Cavernous Bodies of the *Penis* diſtended.

G. One of the Bulbs of the Cavernous Body of the *Urethra* alſo diſtended.

Theſe *Bulbi* were open'd on the other ſide, ✠ to fill the Cavernous Bodies with Quick-ſilver, but are all expreſt as they ought to appear on both ſides in the following Figure.

H. The *Urethra.*

I. The Muſcles dryed, expreſt Fig. 2 and 3. F F f f G.

K k. The Veins tyed up to keep in the Mercury, as they paſs the Muſcles of the *Bulbi..*

Fig. 5.

The back part of the *Penis* expreſt in the preceding Fig.

A B. Its forked *Glans.*

E E. Parts of the Veins ariſing from the *Glans.*

F F. The Bulbs of the Cavernous Bodies of the *Penis.*

G G. The two Bulbs the Cavernous Body of the *Urethra.*

H. The *Urethra.*

K K k k. The Veins tyed up, as they paſs out of the *Bulbi* to keep in the Mercury.

Fig. I.

Fig. II.

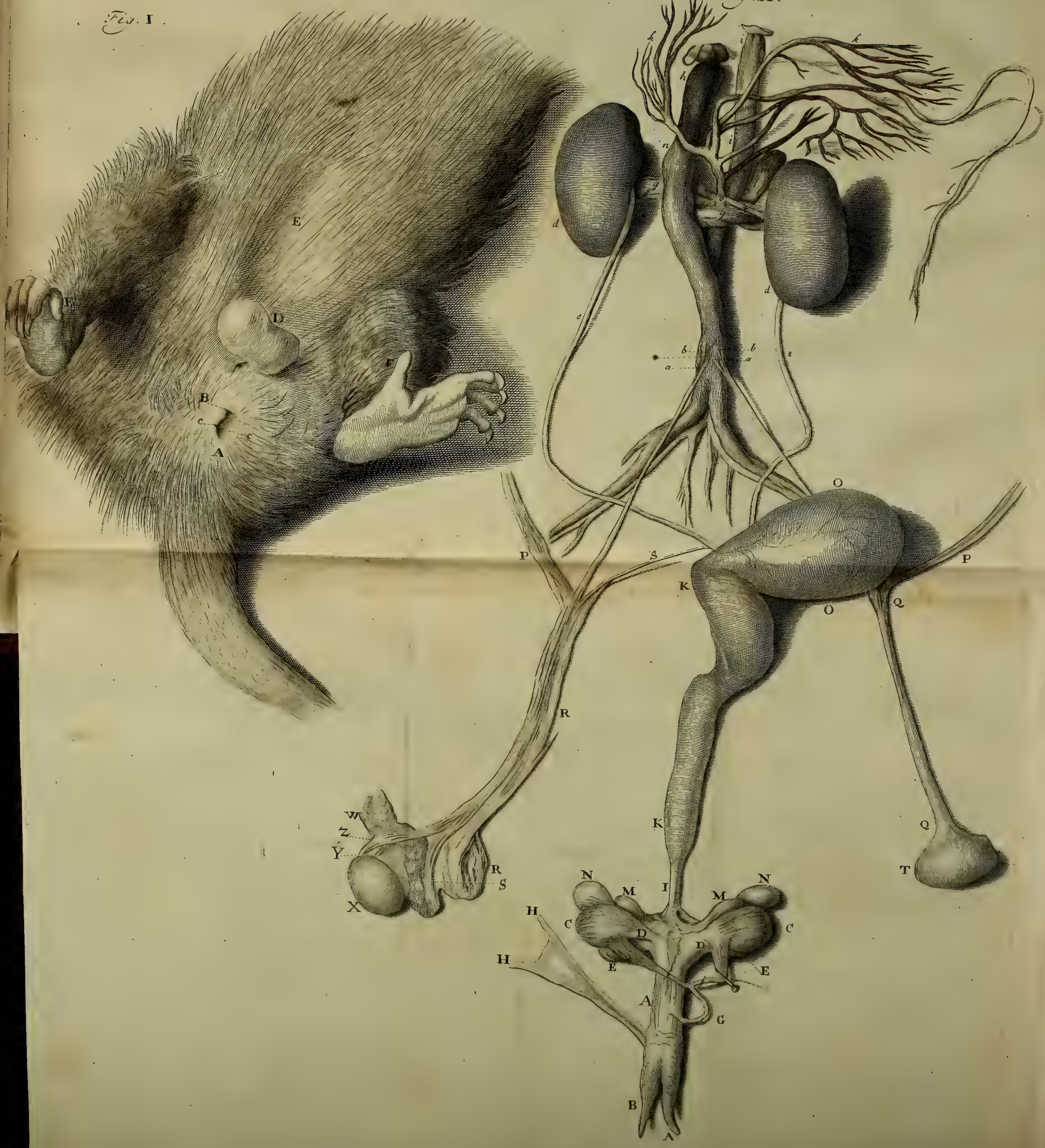
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Fig. III.

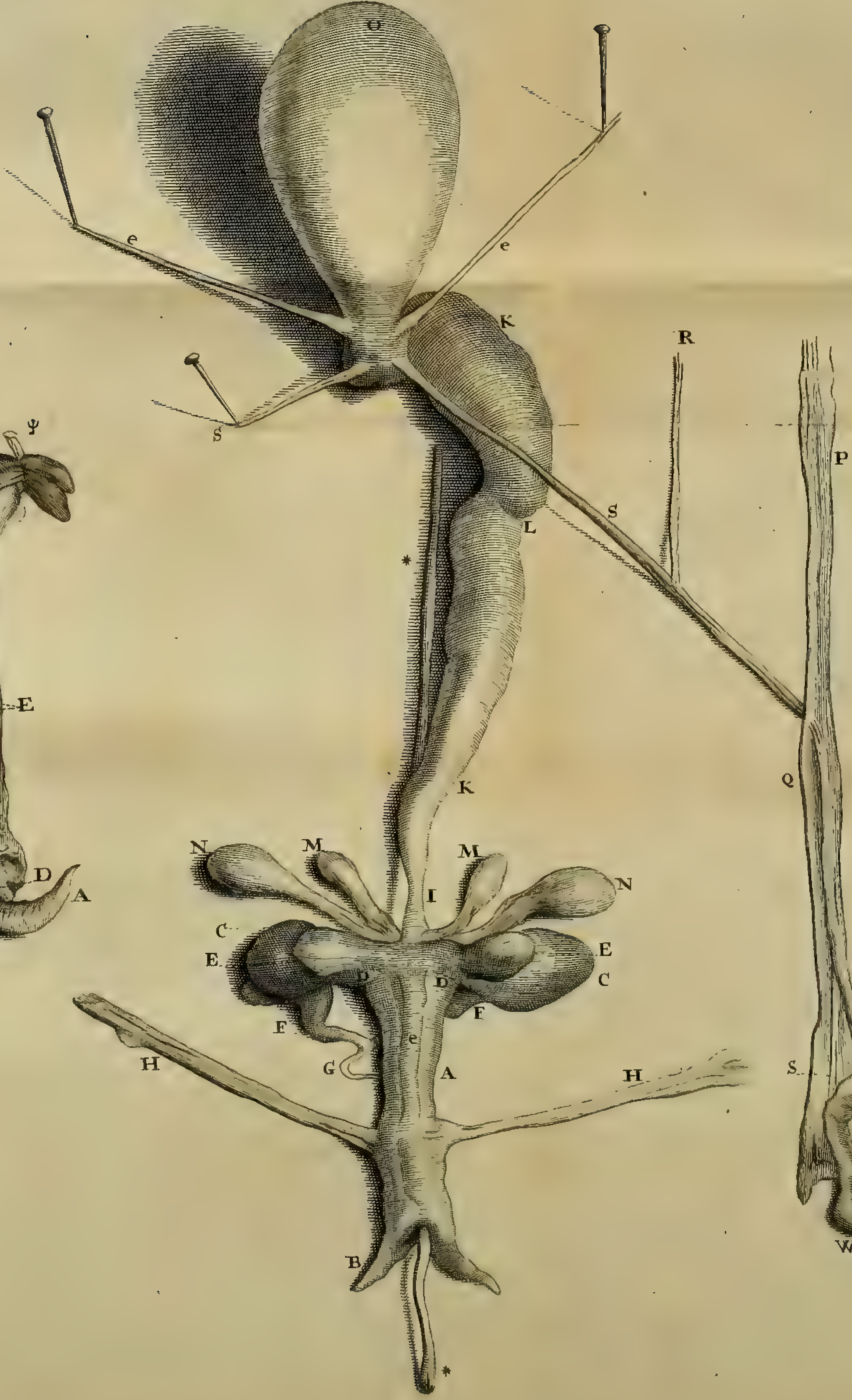


Fig. IV.

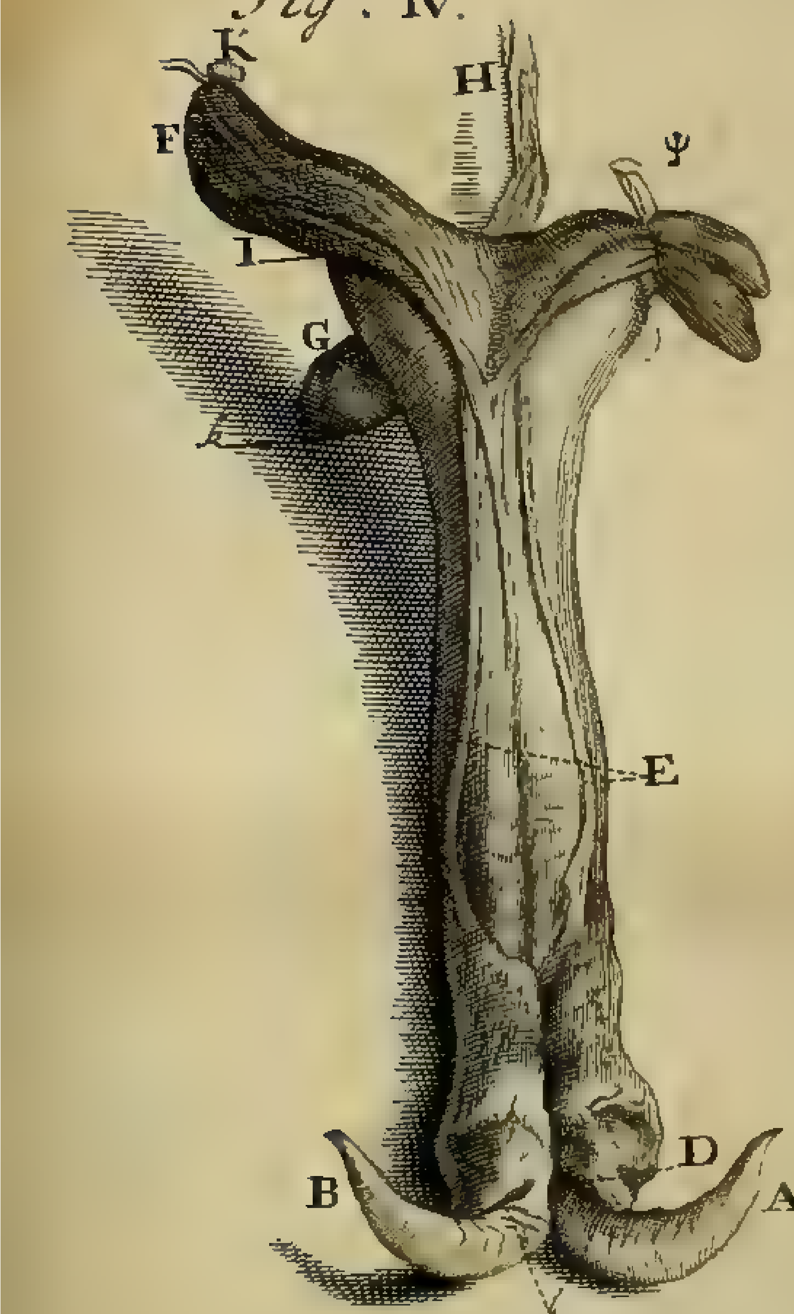
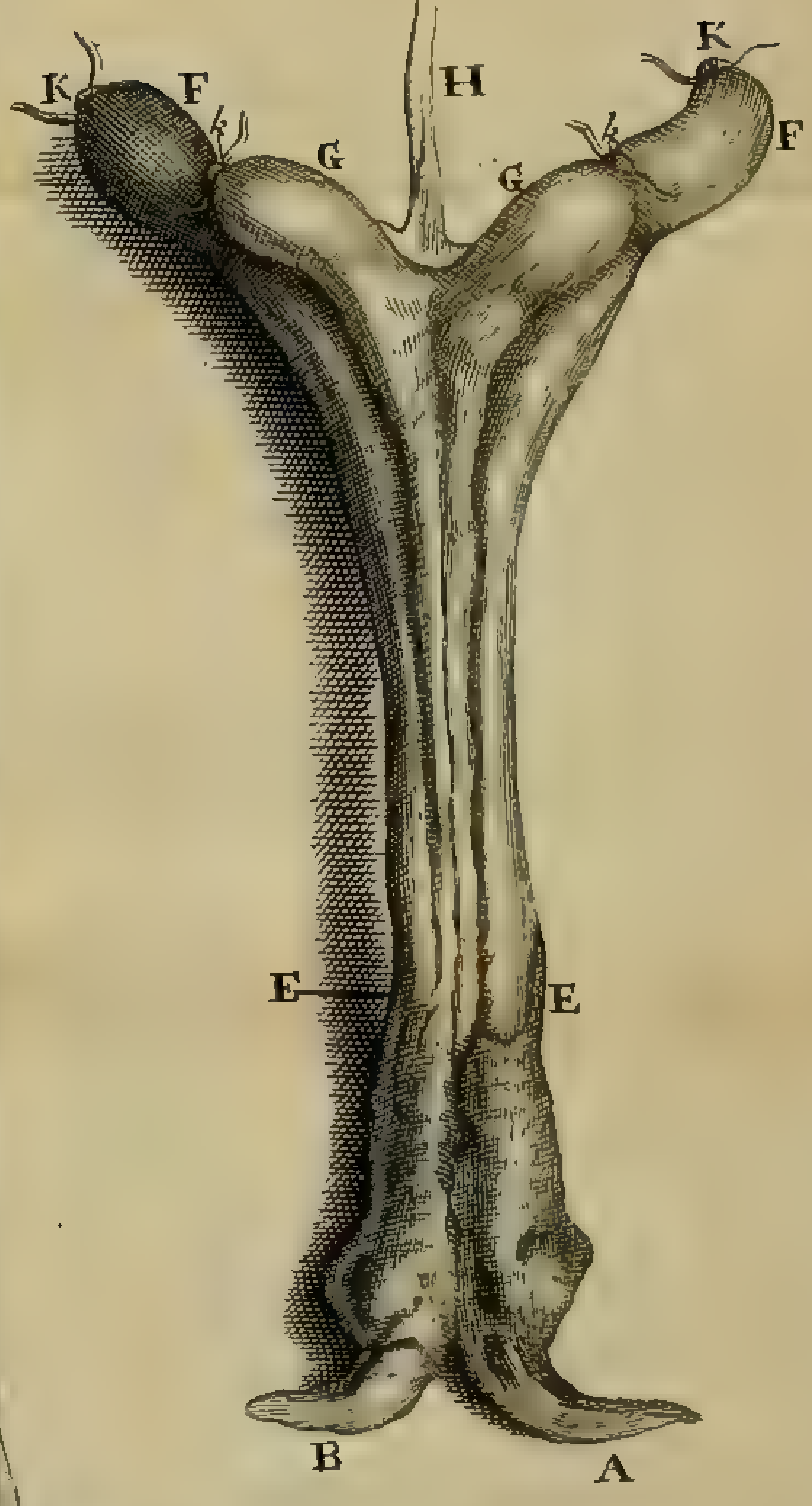


Fig. V.



IV. *Tractatulus de* Ambaro, *a Reverendo D. D. G. J.* Camello, *communicatus D.* Jacobo Petiverio *Societatis Regiæ Socio.*

AVicenna ſcribit, *Ambarum* fungorum in rupibus, ac arboribus more in Maris Alveo generari. *Alii* non ſecus, ac in terra fungos ſuper marinas enaſci aquas. *Hieronymus* à *Huerta* in Annotationibus Traductionis *Plinii*, certas aſſerit eſſe algas, ſeu excrementitias maſſas ſuper Maris aquas in forma fungorum enatas, quæ recenter collectæ inodoræ, nec fragrantiam ſpirant, donec curentur: Nec bituminis genus, aut balænæ eſſe ſemen eò quod iſta ſemel indurata, nequaquam ut *Legitimum Ambarum* rarefieri queant. *Jonatius Alzina* in Hiſt. *Biſaí.* eò quod aliquando & balæna evomatur, in ea nonnunquam inveniatur, & at *Indius* Taeſa bonganſiſo, *i. e.* excrementum balænæ *vocetur: Ambari* materiam algas, ſeu plantas eſſe marinas reſinoſas, aut reſinam maris in fundo creſcentium arborum, aut ex jam putridis algis, ac maris recrementis enatam mucilaginem a balænis depaſtam conjecturatur. *Nicolaus Monardes* bituminis genus ex fontibus in alto mari manans, quod & *Guili.* du *Wallig.* defendit. *Alii*, & *Simon Sethi* in diverſis ſcaturire locis, & eſſe ejus fontes ut bituminis. *Garcias ab Orta* opinatur veriſimiliter Inſulas, aut terras ſimilis c. *Ambaro* formæ inveniri. *Ferd Lopez. Caſtanneda* Avium *Inſulæ* de *Maldiva* quæ herbis paſcuntur odoriferis eſſe ſtercus. *Car. Cluſio* narravit *Servatius Marel* eſſe recrementa in veræ balænæ ventriculo congeſta ex materia viſcoſa. *Alii* ex Piſce *Azelo* devoratum proximè dorſi ſpinam eximi. *Ferd. Caſtrillo* liquorem piſcium collectum circa eorum eſophagum, ut *Braſilia* reduces teſtantur.

tur. *Fran. Combes* Iolo *Incolas* excrementum eſſe piſcis *Gadiamina*, qui differens, & balæna major eſt, narrare refert.[a] *Alii* ex fructu quodam odorato à balæna devorato fieri volunt: *Alii* ſperma, *alii* hepar, *alii* cum Sinis (qui illud *Hay ano ſay*, vocant, *i. e.* preſervans veſtimenta à Tinea) excrementum balænæ, nonnulli maris ſpumam eſſe contendunt. *Cteſias* apud *Ariſt.* Semen *Elephantis. Fuchſius* factitium ex ligno aloes, Zibetho, Styrace & Ladano. Indi *Lutai* apud *Combes*, ex arboris marinæ, maximæ & aromaticæ muſcoſis, viſcoſiſve fieri adherentiis aut acrementis. *Alii*, & hi prudentiores ex ejuſdem arboris reſina, cui opinioni & ipſe author accedit, adjiciendo *Ambarum crudum* odoris eſſe expers, & adeo *Pilis* (Amygdalo-piſtacea eſt) reſinæ ſimile eſſe, & uti hanc facile inflammabile, ut multi incauti decepti avaritiæ ſuæ debitas luerint pœnas. *Hieronymus* à *Huerta* opinionem eſſe quorundam, *Ambarum* reſinam l. gummi eſſe arborum, aut Pini reſinam. *Thomas Bartholinus* in Actis Medico-Philoſophicis *Haffnienſibus* Anni 1673. Obſ. 122. f. 306.[†] eoſdem cum ſuccino habere affirmat natales, (poſtquam videlicet comprobaſſet *Succinum* arborum eſſe reſinam) nec dubium eſſe arbores odoratas in novo orbe ſimiles profundere ſuccos. *Tacitus* ut orientis arbores *Thura*, & *Balſama* (cur non & *Ambarum*?) ità & occidentis credibile ſudare ſuccinum ſcribit. Ex his omnibus opinionibus & conjecturis, quis opinioni, *Ambari* originem ab arboribus deducentium, utpote veriſimili ac probabiliori non ſubſcribit? More fungorum etenim generari valde dubium eſt. Algas, aut maris recrementitiam putrilaginem materiam eſſe poſſe *Ambari*, non facilè crediderim. Herbas aut arbores reſiniferas in ipſo mari enaſci necdum conſtat. Bituminis, aut terræ genus eſſe, non eſt veriſimile. Fictitium eſſe, falſum eſt. Avium ſtercus, Elephantis ſemen, Balænæ, aut alterius Piſcis eſſe liquorem, hepar, ſperma, aut excrementum, fabuloſum videtur. A *Balænis* nihilominus, aut aliis Cetaceis, aliquando Ambarum tanquam nutritioni prorſus

[a] *Joes Leon* in Deſc. *Africæ* Piſcem *Ambara* Ambarum *ejicere ſcribit.*

[†] Quod & *Odoardus Barboſa* Annotat.

ſus ineptum evomi, (quod & *Odoardus Barboſa* annotat) in earumve eſophago, aut ventriculo nonnunquam ut indigeſtibile inveniri lubens conceſſerim, ſiquidem hujuſcemodi monſtrua oblatas offas, nequaquam ut pueri poma diligere, aut prælibare ſolent, ſed quicquid faucium eorum hiatui influxerit, ingurgitant. * Reſinoſum itaque ſalvo aliorum judicio liquorem, quem *Indi* variarum provinciarum *Agacahac* l. *Hagac-hac. Bintogo* l. *Bintoco. Apitono.* & *Malibaho. Cayancang.* & *Bolotic* alii vocant, quemve unum eundémve cum eâ ſiccâ, & induratâ reſinâ, quæ mihi de montibus *Ilocos*, & *Paynan* in magnis alata fuit fragmentis, eſſe judico: *Ambari* legitimam materiam eſſe ſuſpicor. Verùm tempeſtuoſâ obortâ procella, & pluviarum continuatione, univerſali factâ inundatione à mediterraneis latebris, ac & ſpinetâ inacceſſibilium montium jugis, torrentium impetuoſo, ac verſabundo curſu præcipitanter in mare delatum, ibidémque à decumana fluctuum exagitatione, & concuſſione æſtuante marina aqua non nihil emollitum ac elotum, beneficio particularum Salis marini, nec non Solis demum accedentibus ardentiſſimis radiis, itâ immutatum, elaboratum ac præparatum, ut tandem placato turbine ad littus refluis propulſus fluctibus à reſina recenter ex arbore collecta, aut etiam tractu temporis in montanis deſiccatâ, diſtinctiſſimam violento nempe hocce beneficio acquiſitam præſeferat formam *, eamve prouti ſcilicet, pluſve minuſve temporis aqua marina maceratus, fluctuum concuſſione elotus, ac Solis excoctus, ſeu dealbatus fuerit ardore, magis aut minus candidam. Verùm communiter non niſi poſtquam Pluviarum continuatione mediterranea inundentur, & terribilium ventorum furia exagitatam fuerit mare, horrenda fluctuum concuſſione abyſſos ipſos, & ſinuum ac concavitatum latebras everrendo ſordes tanti ponderis in littus rejiciuntur. Hujus conjecturæ certum, & evidens præbent. Argumentum Anno 1694. Januario *Manilam* allata *Ambari* fruſta grandiora, ſolida, pura & hetogeneis carentia, in littore circa *Palagpag* collecta. (Nota, poſt ſub finem *Februarii* 1693. horribilem exortam

* Ipſum l. conſimilem.

Barboſa aeri, Soli, & Lunæ continuò expoſitum reſinare tradit.

tam turbinem) erant autem *partim* coloris opacioris *ſuccini flavi*, ſeu facie gummi *Arabicæ*: vitro criſtallino vix non pellucidiori de *Ilocos* miſtæ reſinæ magis in luteum vergentia: Reſinæ verò de *Paynan* allatæ propemodum ſimilia, ſed minus odora, uſta videlicet, igne ut hæc & altera facile liqueſcentia, & lapideæ ferme duritiei, ità ut nec Culter nec dentes ſignum imprimerent. *Partim* ſeu latere uno ex candido griſea, varie fiſſa, friabilia quidem, ſed omni hucuſque à me viſo *Ambaro* ſolidiora. Pro *Ambaro* autem omnium optimo genuino, & legitimo divendita fuerunt. Huic meæ opinioni non invitus objecerat adverſarius, non poſſe eſſe *Ambarum* hujuſcemodi arborum reſinam, eò quod fruſta maxima reperta fuerint, cui reſpondebam fieri poſſe, ut varii hujus reſinæ glumi obvios inter fluctuum recurſus, aut etiam torrentium decurſus, utpote homogenei, & tenaces ſocientur, ſibi cohæreant aglutinentur, & in fruſta majora denique abeant, ac conglomerentur. Et quid ni magna poſſibile eſt reperiri hujuſcemodi reſinæ fruſta, cum hujates montes arbores reſiniferas incredibilis alant vertitatis, & ad *Pilis* & *Lauvan* caudices ſæpius centenarii colligantur reſinæ, & fragmenta de *Ilocos* ac *Paynan* allatæ reſinæ ſanè maximum fuiſſe glomum, unde deſumpta fuerant, teſtentur. *Fran. Combes* in *Hiſt.* Inſularum *Mindanai* f. 15. refert in littore *Iolò*. (*Batavis* Inſula *Margarifera*) fuiſſe repertum fruſtum *Ambari*, bovini corporis trunco majus, ſed reſinæ ordinariæ locô vix non fuiſſe conſumptum. *Idem* referre videtur *Fran. Colin* in *Hiſtoria Philipinarum* f. 49. ſcribens circa *Inſulam Iolò* fruſtum *Ambari*, griſei, & optimi inventum fuiſſe ultra ducentas libras pendens. Et idem *Ignatius Alzina* in *Hiſt. Byſaiarum* recenſere puto, qui dicit in *Iolò* fruſtum fuiſſe collectum corpore humano craſſius, & duplo longius, vilique ob copiam diſtractum fuiſſe pretio. An. 1632. ad promontorium *Sancti Spiritus* in Coſta de *Igbabao* ambari fragmentum 55 circiter librarum inventum fuit, cujus uncia 30 Imp. quia ſanè optimum fuit, divenditum eſt.

Indus ſiquidem, cui ſors obtigerat tres impleverat corbes, quorum duos ob cognitionis, & exinde eſtimationis defectum, domus ſuæ illuminandi gratia, reſinæ loco inſumpſerat (his uſibus Antiquitus, plerumque *Byſaianis*, Ambarum à reſina non diſtinguendo deſerviebat.) idem facturus cum corbe tertio, niſi hoſpes magis verſatus ex odoris fragrantia, fumi rectâ aſcendentis diſtinctivo, non reſinam vulgarem, ſed nobiliſſimam, ſeu *Ambarum* eſſe prodidiſſet. † In *Bangahun* vetula conchylia legens, fruſtum magnitudinis brachii invenit, pro reſina odorifera ordinaria habuit, (nam variæ & multæ reſinæ odoriferæ ſpecies à mari in littus propelluntur, ut *Batete*, Ambarum redolens, quam *Ambarum* quod vocant nigrum eſſe cenſeo; eo quod curatum, non ſemel pro viliori divendatur *Ambaro. Dairiangao, Raporago, Benzoini redolent, Tangay, Samato.* Aliis *Samata*, liquidambram, aut balſamum ſpirantes.) ſuffumigiis deſtinavit, & fermè in totum antequam quid rei eſſet edocta fuiſſet, conſumpſit. *Ambarum* non raró valde tenax, & picis liquidæ modò molle inveniri multi affirmant, quod & *Fran. Combes* inſinuat dum ſcribit: aliquando in littore liquorem mollem, & recentem colligi, qui aſſervatus, nec non beneficiatus optimum eſſe deprehenditur *Ambarum*. Communis autem & vulgaris eſt opinio, quod & *Hieronymus de Huerta* cum *Fran. Combes* affirmat, *Ambarum* crudum aut recenter collectum, fraganti carere odore: *Joh.* nihilominus *Botero Benes* f. 90. *Ambarum* in *Ava* proſtans, & non adulteratum odoris eſſe ſumme fragrantis, ac acuti, ut naribus admotum illicò ſanguinem profluere faciat. *Alphonſus* de *Ovalle* in *Hiſt. Chilenſi* ſcribit. *Griſeum* eſſe odoris ſuavis, *nigrum* acutioris, differentiam verò hanc odoris, & coloris inde provenire, quod nigrum griſeo breviori tempore in mari, ac Soli expoſitum fuerit. * Dealbationem itaque *Ambari*, & duritiem, ac denſitatem ſali, ſaliniſque maris particulis, prouti *Succini* Soliditatem *Thomas Bartholinus* in Actis Medico-Philoſophicis *Haf.* Anno 1671. *Obſ.* 57. f. 113. adſcribemus.

† *Caſpar Bayam* circa 1680. inter *Adem* & *Mecam* in alto mari *Ambari* truncum prægrandem obvium habuit.

* *Sennertus* de Bitumine & *Ambram* odoratam, Bitumen eſſe ex maris fontibus manans, & in ſummo mari, aeri expoſitum denſari & coagulari, ut ſuccinum, cenſet.

mus. *Ambræ griſeæ* valde candicantis, & ut vocant finiſſimæ, aſſervo partem * quinis conchyliis, & particulà ligni putridi inhærente. Certum argumentum bonitatis gradum à diuturnitate elotionis, & morâ in maritimis fuiſſe aſſecutam. Sed quot capita, tot ſententiæ, abundet igitur quiſque ſuo ſenſu, donec tempus, & curioſorum labor certiora revelent.

* variè exſam & atterebratam

V. *A Letter from Dr* William Oliver, *Phyſician and Fellow of the Royal Society, to Mr* James Petiver, *F. R. S. concerning the* Jeſuits Bark.

SIR,

P*Eru Bark*, comes from a *Tree* about the bigneſs of a *Plumb Tree*, with *Leaves* like *Ivy*, but not quite ſo big, and are always green. The *Indians* call it *Querango*. 'Tis gathered in *Autumn*, and the *Rind* taken off all round, as well from the *Trunk* as *Boughs*, which grows again in four Months, as *Cork* does: The *Trunk* is about the *Bigneſs* of a *Mans Thigh*: It bears a *Fruit* not unlike a *Cheſtnut* (except its outer *Rind* or *Shell*) which is properly call'd *China China*, and is eſteem'd by the *Natives* beyond the *Bark* taken from the *Trunk* or *Boughs*. This *Account* I received from an *Ingenious Apothecary* at *Cadiz* in *Spain*, A. D. 1694. who had lived in *Peru*, and ſeen it growing, and gathered it ſeveral times: From this *Hiſtory* I made this *Obſervation*, that probably *China China*, or the *Rind* of the *Fruit*, was firſt only in Uſe, and the more powerful Medicine, uſed in ſmaller quantities, and that the *Bark* of the Tree came not into play till ſome time after; when the *Vertues* of it, known in *Europe*, occaſioned a greater demand for it, whether this be a juſt Obſervation or no, I ſubmit to your better Judgment.

VI. *Part*

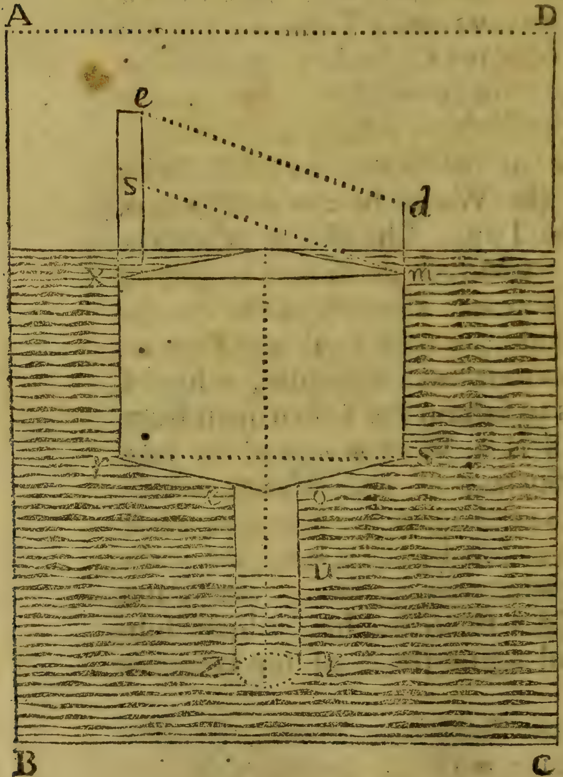
VI. *Part of a* LETTER *from Mr.* Caſwell *of* Oxford, *F. R. S. to the Reverend Mr* Flamſteed, *M. R. S. S. giving an account of a new Baroſcope, invented by him, and communicated by Mr* Hodgſon, *F. R. S.*

SIR,

I Have made a new Sort of Baroſcope, 'tis cheap and very exact, I here ſend you its Calculation as it occurr'd to my Thoughts before I made it. Suppoſe ABCD is a Bucket of Water, in it the Baroſcope $xrezyosm$ which conſiſts of a Body $xrsm$, and a Tube $ezyo$, the Body and Tube are both concave Cylinders communicating with each other, and made of Tin (for want of Glaſs:) The Bottom of the Tube zy has a Lead-weight to ſink it, ſo that the Top of the Body may juſt ſwim even with the Surface of the Water by the Addition of ſome Grain-weights on the Top. The Water when the Inſtrument is forc'd with its Mouth downwards gets up into the Tube to the height yu. There is added on the Top a ſmall concave Cylinder, which I call the Pipe, to diſtinguiſh it from the bottom ſmall Cylinder, which I call the Tube: This Pipe is to ſuſtain the Inſtrument from ſinking to the Bottom, md is a Wire ms, de are two Threads oblique to the Surface of the Water, which Threads perform the Office of Diagonals: For that while the Inſtrument ſinks more or leſs by the Alteration of the Gravity of the Air, there where the Surface of the Water cuts the Thread, is form'd a ſmall Bubble, which Bubble aſcends up the Thread while the ☿ of the common Baroſcope aſcends.

The Circumference of the Body is 21 Inches, therefore its Area = 35: the Altitude $ms = 4$, therefore the Body's Solidity = 140, each Baſe $x\,m$, $r\,s$, has a Convexity whoſe Altitude is 6.5, therefore the Conoid on each Baſe is nearly = 11½, therefore d the whole Body is = (140 + 11½ + 11½ =) 163, and b the entire Altitude of the Body = (4 + .65 + .65 =) 5.3. The Inner Circumference of the Tube is 5.014, therefore its Area n = 2 the Length of the Tube = 4.5, therefore the Tube's Capacity = 9, therefore C, the Content of the Body and Tube = 163 + 9 = 172 Cubic Inches, that is almoſt 2½ Quarts.

Suppoſe the Air's Preſſure when greateſt = 30.5 Inches of ☿ = (30.5 × 14 =) 427 of Water, and f = 427, therefore fc = 73444. Put a for the Depth $o\,u$, of the Air in the Tube when the Body is juſt all immers'd, the Air in the Inſtrument on Immerſion Contracts ſomewhat by the Cold of the Water; this Contraction I find is nearly as much as would be produc'd by an Addition of 1 Inch to the Atmoſphere's Altitude 427, this in cold Weather, but in warm Weather 'tis probably twice as much: but we will now ſuppoſe it = 1, therefore the Depth of the Surface of the Water in the Tube below the Surface of the outer Water is = $b + a$, therefore the Preſſure on that inner Surface is as the Altitude of the Atmoſphere above it = $f + b + 1 + a = F + a$ (putting $F = f + b + 1$.) Then for that the Spaces



ces into which the Air is contracted, are reciprocal to their reſpective Preſſures, and for that while the Inſtrument is out of the Water the Preſſure f anſwer'd to the Space C therefore, $F+a:f::C:\frac{fc}{F+a}$ = Space which the Air takes up in the Inſtrument under Water; therefore, $\frac{fc}{F+a}-d$ = that Part of the Tube which is poſſeſs'd by Air $=an$ (ſuppoſing the Tube's Area $2=n$). Therefore $fc-Fd-ad=Fan+aan$. Therefore $aa+F+\frac{d}{n}\times a=\frac{fc-Fd}{n}$. Put $F+\frac{d}{n}=2g$, therefore $aa+2ga=\frac{fc-Fd}{n}$ therefore $a=\sqrt{:\frac{fc-Fd}{n}+gg}-g$.

Then ſuppoſe the Atmoſphere's Gravity leſs ſo much as to ſink the ☿ $\frac{1}{10}$ Inch = 1.4 of Water, and therefore putting $\varphi=F-1.4$, and in the laſt Equation α inſtead of a, and γ inſtead of g, You have $\alpha=\sqrt{\frac{fc-\varphi d}{n}+\gamma\gamma}:-\gamma$. Thus I find $\left.\begin{array}{l}a=2.72\\ \alpha=2.94\end{array}\right\}$ and therefore $\alpha-a=.22$, which $.22\times n$ gives .44 Cubic Inches, and (ſuppoſing a Cube-Inch = 253 Grains) $.44\times 253=111$ Grains-weight of Water that was gotten up into the Tube in the 1ſt Caſe more than in the 2d, and therefore the Baroſcope requires an Addition of 111 Grains on its Top to ſink it with the Level of the Water in the 2d Caſe more than in the 1ſt, and this upon the ſinking of the ☿ in the common Baroſcope only $\frac{1}{10}$ Inch; Now 1 Grain in this new Baroſcope is nearly as diſcernable as $\frac{1}{10}$ Inch in the Common; and therefore this new Baroſcope is more exact than the Common 111 Times.

Put

Put $f = 247$. $c = 172$. $d = 163$. $n = 2$ as above, only change F, put F 437.3, that is, ſuppoſe the Body ſunk in Water 4 Inches lower; In this Caſe $\alpha = 208$, therefore $a - \alpha = .64$ which multiplyed into $\varphi\, n = 1.28$ Cubic-inches, which × 253 gives 324 Grains, and ſo much the Body's Top $x\,m$ being ſunk 4 Inches under Water, the Body becomes heavier, than while $x\,m$ was at the Surface of the Water. Therefore this 1.28 divided by the aforeſaid Depth 4 gives .32 the Area of the Top Pipe ſuch as would ballance or buoy up the Body at any Depth. Strictly ſpeaking the Pipe ſhould be gradually bigger upward in order to ſuſtain the Inſtrument at any Depth, but as to Senſe 'tis Cylindrical, and its Circumference = 2.005. But for that the leaſt Alteration of the Air would make the Body's Top $x\,m$ in that caſe paſs thro' the 4 Inches (which 4 Inches I ſuppoſe all the Variety of Depth that the Inſtrument has room given it in the Bucket to aſcend or deſcend) therefore the Pipe is made a ſmall matter bigger, (*viz.*) its Circumference is 2.14; whereby the Pipe, according as the Body ſinks more, gives more reſiſtance to the deſcending Body. The Pipes Area is .3643: Therefore the Capacity of the Pipe in 4 Inches Altitude is = 1.457. But as aboveſaid to give juſtly no reſiſtance, its Capacity ſhould be 1.28. Therefore this 1.28 taken from 1.457, leaves .177 the actual reſiſtance in 4 Inches depth, *viz.* (.177 × 253 =) 44 Grains.

But this reſiſtance will not be the ſame in all weathers, in order therefore to calculate what it will be when the ☿ of the common Baroſcope is very low: For example, but 28 Inches high = 392 of Water; f muſt be ſuppos'd = 392, therefore $F = f + b + 1 = 398.3$, and the reſt as before; *viz.* $d = 163$, $f\,c = 67424$. $F\,d = 649229$. Thence by the aforeſaid Equation

$$\left.\begin{array}{l} a = 2.59 \\ \alpha = 2.84 \end{array}\right\} \text{Therefore}$$

$\alpha - a = .25$, which × n gives .50 Cubic Inches, which × 253 = 126 Grains. So that this Baroſcope when the ☿ is loweſt, is more exact than the common 126 Times, ſuppoſing the Body immers'd afreſh when the ☿ is ſo low.

Next while the ☿ is ſo very low, ſuppoſe the Top of the Body depreſs'd 4 Inches under Water; therefore $\varphi = F + 4 = 402.3$, the reſt are as before, *viz.* $fc = 67424$, then α will be 1.9: but before, while the Top of the Body was at the Surface, α was 2.59. Therefore the Difference 69 × Tube's Area 2, gives 1.38 Cube-inches, which × 253 gives 349 Grains, and ſo much the Baroſcope is heavier when the Top xm is 4 Inches under Water, or which comes to the ſame, ſuppoſing that ☿ at 28, and xm at the Surface; this Baroſcope by the ☿'s aſcending $\frac{4}{14}$ Inch will become heavier 349 Grains. The Pipe's Capacity in 4 Inches Altitude was 1.457, from which take the aboveſaid 1.38, the reſidue = .077, which × 253 gives 19 Grains in 4 Inches; ſo that the Pipe will ſuſtain the Baroſcope, and alſo 44 when the ☿ is $30\frac{1}{2}$ high, and but 19 Grains when the ☿ is 28 high. The fewer Grains difference there are in its ſinking, thro' 4 Inches, the more nice the Baroſcope will be.

There where the Thread cuts the Surface of the Water, is form'd a Bubble, therefore this Bubble while the Inſtrument ſinks in Water 4 Inches, which is all the room that I give it, the Bubble moves on the 2 Diagonal Threads 20 Inches, it follows therefore that 120 Grains difference would make the Bubble walk over 120 Inches, if the Threads were ſo long, but as it has been above calculated, about 120 Grains difference of Weight of the Inſtrument is produc'd by ſo much of the Alteration of the Air, as would make the ☿ of the common Baroſcope $\frac{1}{10}$ Inch: therefore when the ☿ aſcends $\frac{1}{10}$ Inch, the Bubble of this new Baroſcope aſcends 120 Inches; therefore this new Baroſcope is more exact than the Common Baroſcope by about 1200 times.

Ob-

Obſervations made with this new Baroſcope.

1. While the ☿ of the common Baroſcope is often known to be ſtationary 24 hours together, the Bubble of the new Baroſcope is rarely found to ſtand ſtill 1 minute.

2. Suppoſe the Air's Gravity encreaſing, and accordingly the Bubble aſcending, during the Time that it aſcends 20 Inches, it will have many ſhort deſcents, of the Quantity of ½ Inch, 1, 2, 3, or more Inches, each of which being over it will aſcend again. Theſe retroceſſions are frequent, and of all Varieties in quantity and duration, ſo that there is no judging of the general courſe of the Bubble by bare inſpection, though you ſee it moving but by waiting a little time.

3. A ſmall Blaſt of Wind will make the Bubble deſcend; a Blaſt that can't be heard in a Chamber of the Town, will ſenſibly force the Bubble downward. The Blaſts of Wind ſenſible abroad cauſe many of the aboveſaid Retroceſſions, or Accelerations in the general Courſe; as I found by carrying my Baroſcope to a Place where the Wind was Perceptible.

4. Clouds make the Bubble deſcend. A ſmall Cloud approaching to the Zenith works more than a great Cloud near the Horizon. In Cloudy weather the Bubble deſcending, a break of the Clouds (or clear Place) approaching to the Zenith, has made the Bubble to aſcend; and after that break had paſs'd beyond the Zenith a conſiderable Space, the bubble again deſcended.

5. All Clouds (except one) hitherto by me obſerv'd, have made the Bubble to deſcend. But the other day the Wind being *North*, and the Courſe of the bubble

deſcending, I ſaw to the Windward a Large thick Cloud near the Horizon, and the bubble ſtill deſcended, but as this Clound drew near the Zenith it turn'd the way of the bubble making it to aſcend, and the bubble continued aſcending till the Cloud was all paſs'd, after which it reſumed its former deſcent. It was a Cloud that yielded a cold ſhower of ſmall Hail.

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Fig: 5.

Fig: 4.

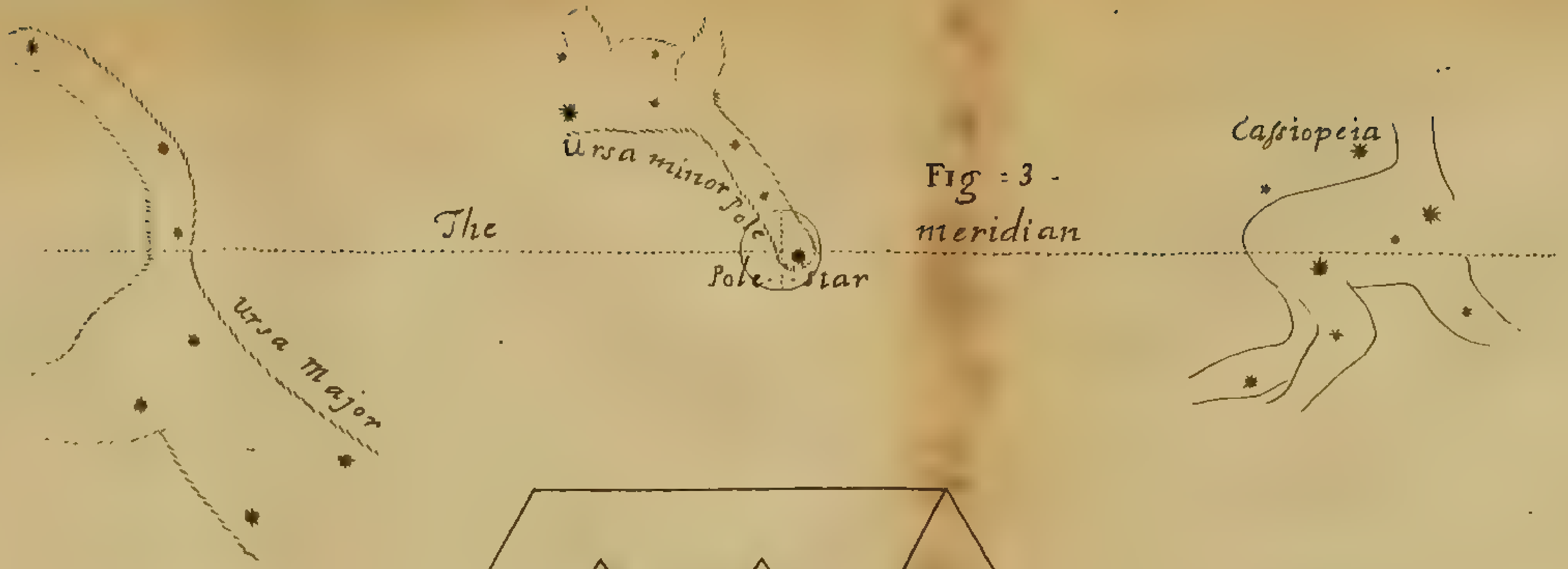
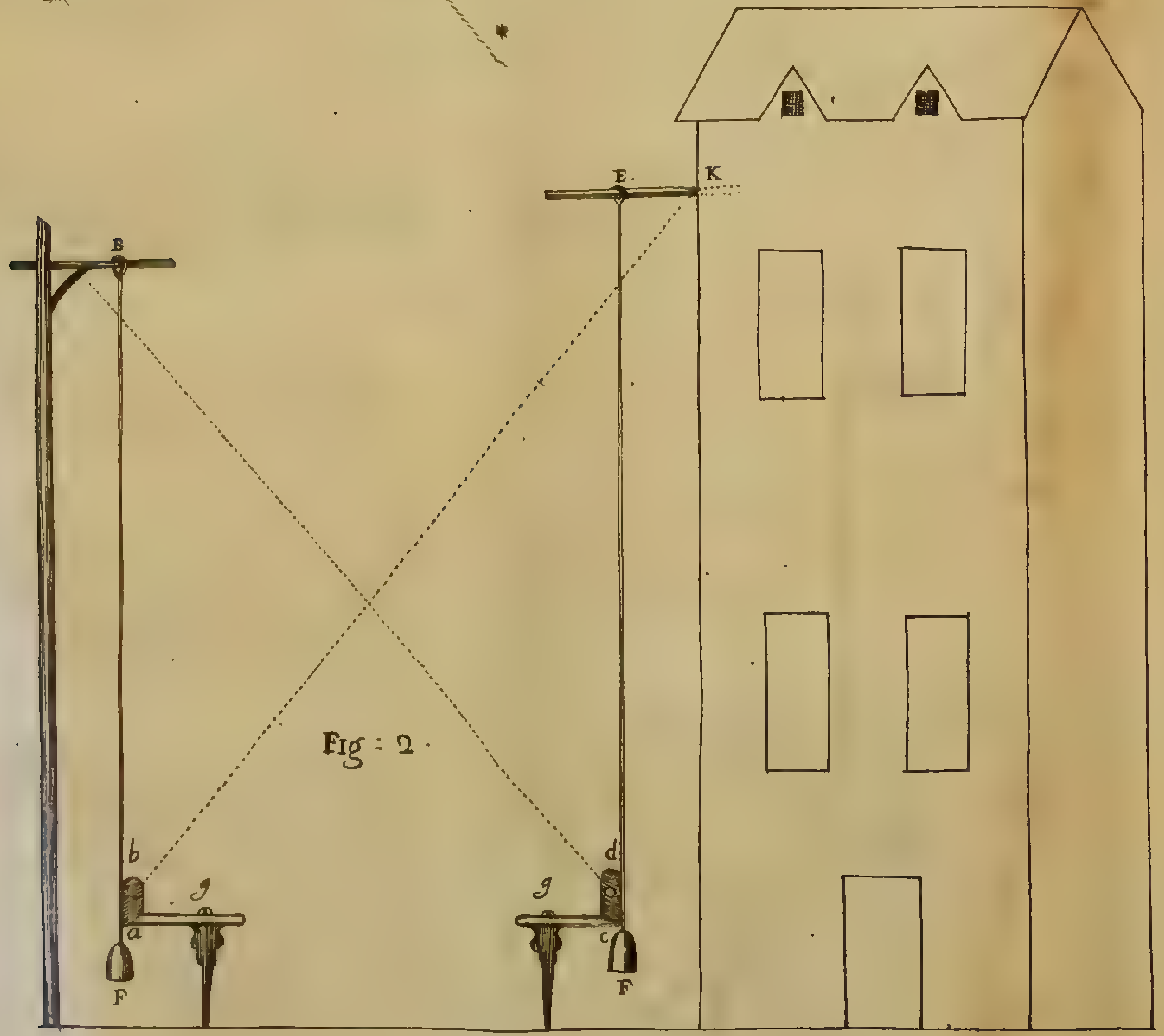


Fig: 3.



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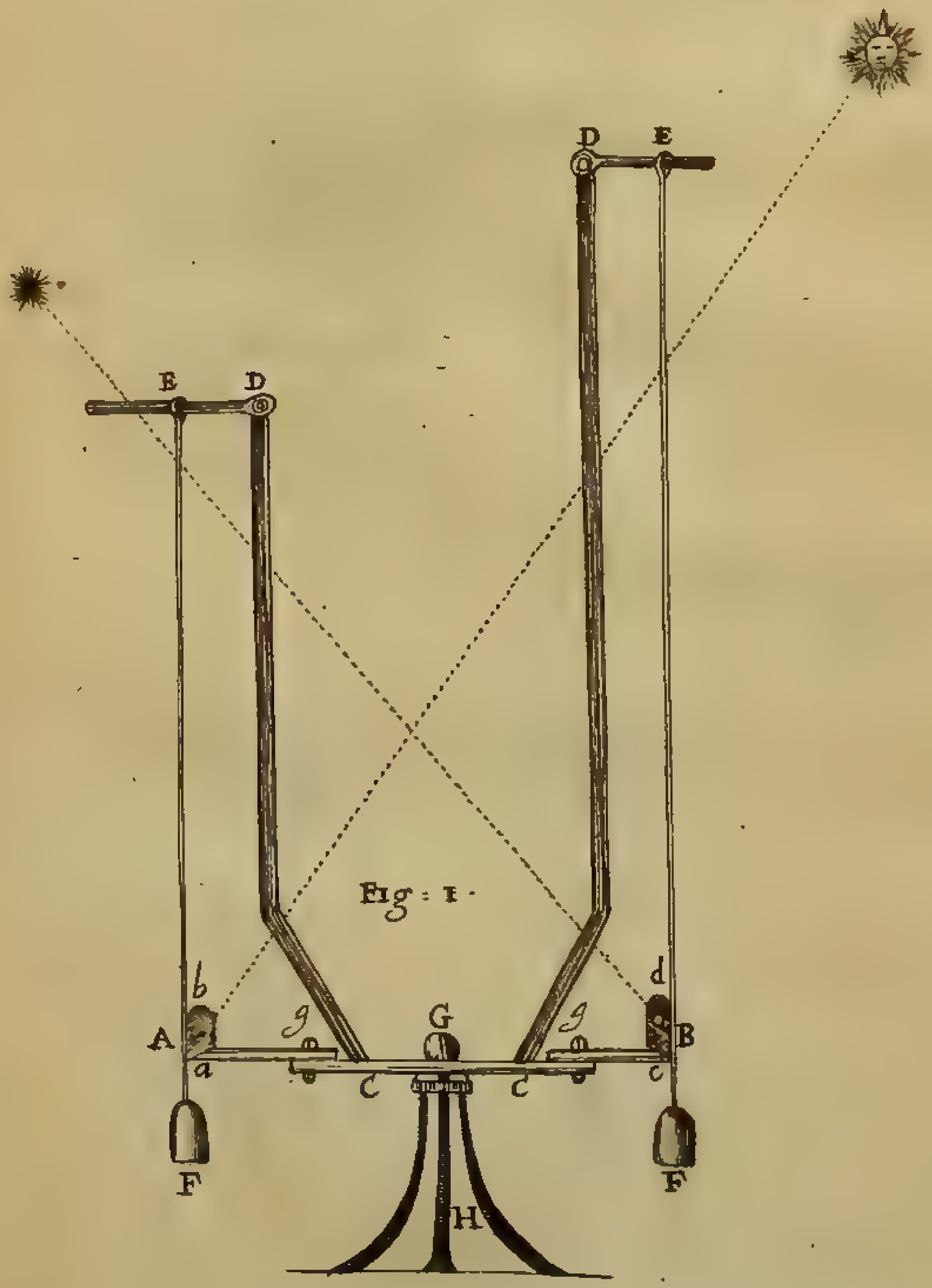

Fig: 1.

(Numb. 291.)

PHILOSOPHICAL TRANSACTIONS.

For the Months of May *and* June, 1704.

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I. *Part of two Letters from Mr* Edward Lhwyd, *Keeper of the* Aſhmolean *Repoſitory in* Oxford, *to Mr* Samuel Dale *of* Braintree *in* Eſſex, *concerning Foſſils.*

Oxford, Sept. 19. 1701.

"THe ſtate of theſe Bodies is quite different in your parts from what it is in *Wales* and *Ireland*. In thoſe Countries the Shells are generally *Cryſtalline*, but with you (and ſometimes hereabouts) they are *teſtaceous*: Which difference is doubtleſs to be attributed to the Soil, and particularly to your Chalk and Flint, which all thoſe Countries want, excepting a ſmall part (I know not by what chance of *Diluvian Diſſolution*) got into the *North* part of *Ireland*. But there 'tis remarkable that their Chalk is abſolutely petrify'd: I mean, whereas the Flints are here imbodyed in Chalk, they are there in a Chalk white *Lime-ſtone*. And as your Chalky Countries only afford thoſe *Echinitæ* I have ſtil'd, *Pileatus*, *Galeatus*, and *Cordatus*: So I could never find them in all my Travels but at that place; from whence in the time of *Paganiſm* the *Druids* procur'd them, and ſold them amongſt our *Northern Britains* for Stones of Miraculous efficacy againſt perils by Fire and Water; perſwading the Vulgar they were generated in *Cocks-knees*; as Thouſands in the *High-Lands* believe at this day. And one Fellow had the Impudence to tell me (finding me a little hard of belief) that he himſelf had taken one (that his Maſter had ſhew'd me) out of a Cocks knee with his own hand.——

Oxford, Nov. 10. 1701.

—— WE were ſurpriz'd here, to find ſo many *Foſſils*, ſcarce diſtinguiſhable from *Sea Shells* : for, as I mention'd before to you, the caſe is otherwiſe in thoſe places I ſearched. We have indeed in theſe Parts one or two *Foſſil Shells* of a *Teſtaceous* ſubſtance ; but in colour they recede farther from thoſe of the Sea than yours. I find by thoſe ſent me, that you ſometimes find them imbedded in ſolid Stone : Which takes off any objection ſome might offer, of their being an accidental ſcattering of *Gulls*, *Crows*, *&c.* on the *Harwich Cliffs.*

Looking upon this occaſion into *Cambden's Britannia*, I find in the laſt Edition a Note concerning a *Petrifying Spring* at *Harwich*, which reduces Clay and Wood into Stone, of which I ſhould be glad of ſome particular account from you at your leiſure: as alſo of the place where theſe are found, particularly how far the furtheſt from the Sea.

II. *A Letter from Mr* Samuel Dale *to Mr* Edward Lhwyd, *Keeper of the* Aſhmolean *Repoſitory in* Oxford, *concerning* Harwich *Cliff, and the Foſſil Shells there.*

Braintree, Feb. 1703.

SIR,

THat I have been ſo long before I anſwer'd your kind Letters, I ſhall only offer one reaſon in excuſe, which is my being deſirous of making another *Tour* to *Harwich, &c.* before I wrote, that I might accompany this with ſome Foſſils, and make my obſervations more perfect: The account therefore you deſire, take as follows.

Harwich Cliff is a ſort of *Promontory*, which divides *Orwel Haven* from the *Æſtuarium* contained between that and *Walton Naſe*; it is ſcituate on the Southern part of the Town, about a quarter of a mile diſtant or not ſo much, and contains many acres of Land. The height of it from the Strand or Beach to the top, where its higheſt is 40 or 50 foot. At the bottom of this Cliff, there is a *Stratum* of Clay about a foot thick, which is ſucceeded by another of Stone for a foot more; in this *Stratum* of Stone are imbedded divers Shells (though but thinly) as well of the *Turbinate* as *Bivalve* kind, and alſo pieces of Wood and Sticks, as you may obſerve by the Fragments thereof, which I have ſent you. Over this are divers *Strata* of blueiſh Clay, of which you have alſo a Sample about the height of 20 foot or more; this Clay hath *Pyrites* or *Copperas* Stones ſticking in it, but no Shells that I could obſerve. Above this are likewiſe divers *Strata*, which reach to within about two foot of the Surface, ſome of which are only of fine Sand, other ſmall Stones and Gravel mixt with fragments of Shells, of which I likewiſe ſent you a *Specimen*, and in others ſmall Pebbles are mixt; and it is in ſome of theſe laſt mentioned *Strata*, that the *Foſſil Shells* are imbedded, which lye promiſcuouſly together, I mean the *Bivalve* or *Turbinate*; neither do the *Strata's* with the Shells obſerve any order in their lying, being ſometimes higher and ſometimes lower in the Cliff; and ſometimes 2 or 3 one above another with other *Strata's* of Sand, Fragments and Gravel between. Above all theſe is a covering of common Sandy Earth, which is about 2 foot thick, in which, in ſome places are Veins of a Species of *Oſteocolla*, tho more tender than *Oſteocolla Officinarum*, which is brought from *Germany*: This I have adventured to call *Oſteocolla Anglicana*, it doth incruſt about ſmall Strings like the Fibres of the Roots of Trees, it's of divers magnitudes, and ſends forth Branches here and there, but is ſo tender, as not to be gotten out of the Earth in any large pieces. Whether like the *German* it appears above the Earth, I never could diſcover.

Before this Cliff, the Shoar, as far as the ebbing of the Sea would permit my obſervation, was rudely paved with Stones, divers of which are vein'd with that ſort of Body, which by *Helmont* and other later Naturaliſts, is called *Ludus Paracelſi*: Of theſe Stones the Inhabitants have a tradition that they are form'd by the Clay, which tumbling down from the Cliff, and being waſhed by the flowing of the Sea, are in a ſhort time converted into Stone; and the ingenious Mr *Silas Tayler* in his Manuſcript *Collections of Harwich and Dovercourt*, (a Copy of which I have) thus writes concerning it. *The Waſhing of theſe* Cliffs *diſcovers a blueiſh Clay, which tumbling down upon the Shoar, altho waſhed by the Sea at High-water, within a ſhort*

time

time turns into Stone: There they may be ſeen, ſome that are new fallen as ſoft as the Clay in the Cliff, and others that have lain there longer cruſted over and hard, but if opened or broke, the Clay ſtill ſoft in the middle; others that have lain longeſt petrified to the very heart, and with theſe the Walls *of the* Town *are for the moſt part built, and the* Streets *generally are pitch'd.* How far this is matter of fact I will not determine, my ſtay at *Harwich* being always too ſhort for me to make obſervations ſo critical as this *Phænomenon* doth deſerve; and altho I muſt at the ſame time own that many of the Stones are waſhed out from the *Stratum* at the bottom of the Cliff, yet I have ſometimes been inclined to Mr *Tayler*'s opinion, becauſe he lived long upon the Spot, being *Store-keeper* of the *Kings Building yard* for many years, and by his *Collections*, *&c.* ſeems to be a perſon of Probity and Learning: and alſo becauſe divers of the ſaid Stones have cracks or chops in them, as Clay and Earth will have by being expoſed to the Sun; and there is yet [*Anno* 1702.] lying upon that Shoar a Stone, in which a large pile (perhaps of Oak) ſuch as was formerly made uſe of there to preſerve the Cliff from the injuries of the Sea, doth evidently appear to be imbedded; which can owe its ſituation to no other Original, than by being preſt into the ſuperficies of the Clay while ſoft, and petrifying with it, which being ſquare, takes off an objection which ſome might make had it been round, of its being lodged there in the general Deluge.

I am not inſenſible that this manner of Petrification is not only different from the common methods Nature uſeth in that operation, but alſo thwarts the opinions of divers Learned and Ingenious men, and it was ſtrenuouſly oppos'd by the Reverend Mr *John Morton* of *Oxendon* in *Northamptonſhire*; when we, together with Mr *John Luffkin*, an Apothecary of *Colcheſter*, were upon the place; the ſubſtance of which diſcourſe he wrote down, and afterwards at my requeſt ſent me, together with his thoughts of *Petrifications*, which perhaps will not be unacceptable to you, and therefore I ſhall tranſcribe it from his Letter, dated *Auguſt* 4th, 1699. ——— *At* Harwich, *under the Cliff, upon the Sea-ſhore, there is a* Stratum *of a* Clayie-Stone, *which is cover'd here and there with ragged Stones of a cloſer texture, which was formerly (I conjecture) another entire* Stratum, *but is broken thus by the Tearing of the Waves. The* Clayie-Stone Stratum, Mr Dale *and* Mr Luffkin *my Companions were of opinion had been formerly a ſofter ſubſtance, but was daily petrified by the Sea Water. Having argued a little about it, when turning to the Cliff, I found a* Stratum *there, of the very ſame ſort of* Clayie-Stone *with that upon the Shore; yet the Sea water very ſeldom comes up hither, unleſs by Storms and at Spring-tydes. I broke a little piece off, and ſhew'd it to you, and then you was convinc'd (I think) it was not hardned or petrified by the Sea water, but in its natural ſtate. And I have often, I aſſure you, met with juſt ſuch ſort of Stone in many of our* Stone-pits *here, in Inland Countries. It appears to me, that the Water ſhould have rather ſoftned than hardned the Stone upon the Shore, tho by waſhing away the looſer Clayie matter and other Earthy ſtuff, that is ſometimes left upon it at the ebb, it might ſeem to be a ſort of* Petrification, *and occaſion this miſtake.*

As to Petrifactions: *I've only obſerved theſe three ſorts.* 1ſt, A Stony Incruſtation *upon Sticks and any thing that lyes in the way, in the Petrifying Springs; the Earth in thoſe Waters is uſually intermixt with particles of Stone, that trickle down into it with the Water, and are there detain'd. Of this firſt ſort you have doubtleſs many inſtances in* Eſſex, *and I think there is one at* Harwich *Cliff; tho this in my opinion is not ſo properly call'd a* Petrifaction. 2dly, *The ſecond ſort is that which is perform'd by the* Permeation *or* Inſinuation *of the finer ſorts of Stony* Particles, *as it is in the caſe of ſome of our Petrifying waters, (I believe) particularly that at* Knaresborough *ſometimes; the Stony particles*

how-

however of the Knaresbrough *Spring are very fine. And many of the* Foſſil-ſhells *have undergone the ſame fate.* 3dly, *The third, which indeed is a* Petrification, *properly ſo call'd, is often met with on the ſides of* Caves *and* Grotto's, *as at* Pooly-hole *in the* Peak, *and in the* Fiſſures, *and* Clefts *of* Mines *and* Quarries. *Of this kind are the ſeveral ſorts of* Fluors, *the* Lap. Stillatitii, Stalagmitæ, &c. *that we meet with in the* Fiſſures, *and* Hiatus's *of the Earth. Theſe are continually growing (as they vulgarly ſay) that is, are receiving an additional increaſe of real and ſolid Stone, as is obſerved in many* Caves *in the* Peak, *&c. This I take to be perform'd in ſuch a manner as the* Incruſtations *are,* viz. *the particles of Stone are brought along with the Water as their* Vehicle, *and are depoſited at length upon the ſides of the* Cave *or* Fiſſure, (*this is matter of fact, that there is always a watry Stream, and uſually Water a trickling down upon the ſides of thoſe* Caves :) *but here the particles of Stone are extremely minute and fine, and do thereby naturally concrete and joyn together very cloſe; whereas in our* Incruſtations *the particles of Stone being groſſer, the Stone is rough, and courſe, and friable. And this I leave to your Judgment if it be not a more reaſonable* Hypotheſis, *than that of* Dr Plot *in* pag. 33 *of his* Hiſtory of Oxfordſhire, *viz.* That the very body of the Water is turned into Stone as it drops down from the Rocks. *I know not indeed of any other ſorts of* Petrification *than theſe I have already mention'd. As to that* Hypotheſis *of the* Tranſmutation *of a* Stratum, *e. g. of Chalk to Clay, of Coal to common Stone, or the like, I muſt confeſs I never met with any thing in Nature which would countenance it, that is, ſuch a* Tranſmutation *in the Bowels of the Earth. Nor is there any thing thing that proves it, that ever I have met with in any* Natural Obſervations. *Only ſome will gueſs and fancy ſuch a thing, but for making it out, I am ſure I am no more able to do it, than to make the* Philoſophers Stone, *whatever they are. Thus I have freely given you my thoughts of theſe things.*

A

A late Author is of opinion, that *this Bed of Stones was the Foundation of the Loamy Cliff, where the Cliff has been waſhed away or cut: And that they are the Production* of a *Vitrioline juice in conjunction with the Loam*; as the common Copperas Stones are by the ſame Juice in a *Gravel*, and that the latter were only to be *found* where the *Cliff was gravelly*, and not *where the Loam is.* How far theſe Stones are the effect of a *Vitrioline Juice*, I will not determin, but this I can affirm, that I have now by me ſome of the *Pyrites* or common *Copperas Stones*, which I did pick out of the *Clayie Stratum* of this Cliff, in which they may be frequently met with, as mention'd in its deſcription. Nor do I remember at any time to have obſerved theſe *Stones* to be *inveſted with* either *Gypſum or Trichitis*, as the ſame Author affirms, but with the aforeſaid *Ludus Paracelſi*, and ſome other ſorts of *Lap. Stalagmitæ* frequently.

How thoſe Shells or Marine Bodies came to be here poſited, is a Subject, which hath imployed the Heads and Pens of divers learned and ingenious men, and your ſelf being ingaged in the controverſy, I ſhall not pretend to ſay any thing thereof, leſt I ſhould be thought like *Phormio* to treat of the Art of War before *Hannibal*, only crave leave to make ſome remarks on the poſitive aſſertion of the aforeſaid Author, concerning the imbedding of theſe *Foſſil Shells* in this Cliff, and the alteration of the Channel, *viz. That* this *Bed of Shells, which covers the Cliff, was carried thither at the making of the Harbour or clearing of it. For the Harbour or Channel there is artificial and of no old date, the Current having been formerly on the other ſide of* Languard Fort, *which then ſtood in* Eſſex. Againſt the firſt part of which, altho many reaſons might be given to prove the contrary, I ſhall only trouble you with the following, and as our Author begs the Queſtion, *How elſe could the Shells lye a top* of this Cliff? So I ſhall alſo ask him, why the ſame Strata of Sand, and Fragments of Shells, with the ſame *Foſſils* imbedded, are to be found at

Walton Neſs on the other ſide of the *Æſtuarium*, which is 5 or 6 miles broad from *Harwich*, as likewiſe at *Bawdſey* Cliff in *Suffolk*, which is 8 or 9 miles diſtant, and in other Cliffs on that Shore, where I have met with them. A ſecond Queſtion may here be askt, How it comes to paſs that none of thoſe *Buccina Heteroſtropha*, (whereof ſuch plenty of their *Exuviæ* are in all the Cliffs hereabouts) are not now to be found in this Channel, nor the adjacent Seas? (where I have divers times been a fiſhing) for I cannot think the clearing this Harbour could have deſtroyed all that ſpecies of Shell-Fiſh, whereof there was then ſuch plenty; and therefore ſome other Original muſt be allow'd them, than what this Author has aſſign'd. Nor can I allow the *Harbour* here to be *Artificial*, becauſe ſo great a work as this is, *viz.* the making a Channel 2 miles wide, as it is in this place, would not have been without ſome Record thereof in Hiſtory, and beſides, the Earth, *&c.* which muſt ariſe by this work, muſt conſequently have made a much greater Hill than the Cliff ever was; and another doubt will from hence ariſe, why the Workmen ſhould bring all the Earth, *&c.* to this ſide the Channel, and not lay ſome thereof on the other, as it's plain they did not. The ground on which *Landguard Fort* ſtands, as far as *Walton Coleneſs*, which is about 3 miles, is only a Sandy Level or Beach, which I believe hath in time ſubſided there, as may be obſerved at the mouths of other great Rivers. And as to the Argument which our Author brings of *Landguard Fort* being accounted to ſtand in *Eſſex*, to confirm his Hypotheſis of the change of this Channel, it will be of no force with any one which doth but obſerve, that not only parts of Pariſhes, but likewiſe of Counties, are often divided from thoſe Pariſhes and Counties to which they belong, and included in others, of which I could give you many inſtances, *e. g.* a part of *Kent* is on the *Eſſex* ſide the *Thames*; and in

Oxfordſhire the Pariſhes of *Shilton* doth belong to *Berkſhire*, *Daylesford* to *Warwickſhire*, *Compton* to *Glouceſterſhire*, and *Stratton-Audley* to *Buckinghamſhire*, altho all included in the other: And there is a Farm which doth belong to this Pariſh of *Braintree*, that is ſeparated from it at leaſt 2 miles, and many others might be given, but let theſe ſuffice. And to me a probable reaſon of this Forts being accounted in *Eſſex*, is, the Sands here ſubſiding, made at firſt, I ſuppoſe, an *Inſula*, which being neareſt to *Eſſex* was accounted of that County; or 2dly, the Iſland ſo made belonging to none but the Crown, it was at the pleaſure of the *Kings Officers* to call it of which County they pleaſed. Nor was it *the Gentleman in Cambden*'s ignorance (whatever this Author ſaith) that made him *mention* theſe Stones *for Petrifactions made by the Sea*, for *Mr Tayler* in his aforeſaid *Collections* did not omit the tradition the Inhabitants of this Town have about the alteration of the Mouth of this Haven, which I will tranſcribe in his own words. *It's generally believed that* Stoure *did formerly in a ſtraighter current (than now it doth) diſcharge it ſelf into the Sea about* Hoaſley-bay, *under the High-land of* Walton-Colneſs *and* Felix-Stow *in the County of* Suffolk, *betwixt whom and* Landguard Fort *are (as they are reputed) certain remains of the old Channel, which the neighbouring Inhabitants ſtill call* Fleets, *retaining at this day the tradition of the courſe of the Water, and the entrance into this Haven to have heretofore been by and through them.*

And I am of opinion that this Tradition is matter of fact, having before hinted to you what mutations the Mouths of great Rivers daily undergo by the lodgment of Sands, *&c.* which may be aſſign'd as a better reaſon for this alteration than that of our Author, *i. e.* that it was Artificial; and the yearly waſhing of the Cliff on the *Harwich* ſide, doth likewiſe add to its probability; it being a conſtant obſervation, that where the Sea gaineth on one ſide it loſeth on the other. And that this level was ſo made I am confirm'd by the modern removal of the Fort, more towards the point, more Sands, I conjecture, being added after the old Fort was built: This alteration is taken notice of by the aforeſaid *Mr Tayler* in theſe words. *And altho ſeveral now living pretend to the remembrance of the building it*; [Landguard Fort] *yet we find there was an ancienter Fort thereabouts, and called by the ſame name* [Anno 1553.] *which was not far diſtant from this modern one, a little North of it, where are yet to be ſeen two* Faces *and* Flankers *of a* Baſtion, *the reſt of it being eaten away by the Sea, but in its place hath left upon the Shoar a long row of Sand Banks.*

The Spring mentioned by the Ingenious *Mr Edmund Gibſon* in his *Engliſh* Edition of *Cambden*, from the aforeſaid Manuſcript of *Mr Silas Tayler*, is a very ſmall inconſiderable thing; nor could I obſerve that it did petrifie or incruſtate either pieces of Wood or Sticks, but I have a piece, which I broke off from a large Pile upon that Shoar, which was petrified ſo far as it was droven into the Earth, and the Sea Water came; and do ſuſpect there yet remains ſome others of the ſame. And of this ſort I believe, is that large piece ſent from hence, which Mr *Tayler* mentions to be *reſerved in the Repoſitory of the Royal Society.*

I have already taken notice, that the *Foſſil Shells* are imbedded in a looſe *Stratum* of Sand, Gravel, *&c.* which may ſerve to demonſtrate that their *Matrix* is not a *Clay bed upon the top* of the Cliff; as likewiſe for another Argument to evince that they could not be there ſcattered by *Crows*, *Gulls*, and other Sea Fowls, as well as that ſome of them are likewiſe bedded in Stone at the bottom of the Cliff; and altho ſome few of them may be met with upon the top of the Cliff, yet it's only where the Earth has been broken by digging of Ditches, *&c.*

And now I think it time to cloſe this Letter, leſt I ſhould quite tire your patience with its length; and ſhall only add a Catalogue of the Foſſils by me found at this Cliff; after I have ſubſcribed my ſelf,

Sir,

Your obliged humble Servant,

S. Dale.

1. Buccinum foſſile heteroſtrophum roſtratum lævem maximum Liſteri referens.
2. Buccinum foſſile roſtratum maximum Liſteri referens.
3. Buccinum foſſile minus ventricoſum mucrone obtuſo.
4. Buccinum foſſile tenue minus ponderoſum, ſtriatum & undatum.
5. Buccinum foſſile tenue confragoſum.
6. Buccinum foſſile ſtrijs prominulis marginalibus inſignitum.
7. Buccino-turben foſſile reticulatum minus.
8. Buccino-turben foſſile Sulcatum.
9. Buccino-turben foſſile roſtratum.
10. Buccino-turben maximum roſtratum foſſile Spiris intùs Strijs elatis inſignitis.
11. Cochlea foſſilis maxima umbilicata quinque Spirarum.
12. Cochlea foſſilis umbilicata mucrone obtuſo.
13. Nerita parva foſſilis.
14. Turbo foſſilis Spiris duabus Strijs eminentibus inſignitis.
15. Pecten minor foſſilis unica aurita.
16. Auricularia maxima.
17. Pectunculus foſſilis fere circinatus Strijs tenuibus, valvis per ginglymon connexis.

18. Pectunculus foſſilis craſſus roſtro acuto Strijs majoribus.

19. Pectunculus foſſilis faſcijs tranſverſis undautibus notatis.

20. Pectunculus vulgaris foſſilis.

21. Pectunculus foſſilis Strijs majoribus & elatioribus.

22. Pectunculus maximus foſſilis Liſterianum maximum referens.

23. Pectunculites maximus Strijs latis.

24. Concha parva foſſilis faſcijs tranſverſis inſignis.

25. Concha longa foſſilis faſciata.

26 Conchites lævis maxima.

27. Conchites parva faſciata.

28. Trigonella minor ſive vulgatior Anglica *Lithoph. Brit.* 816.

III. An Inſtrument, for ſeeing the Sun, Moon, or Stars, paſs the Meridian of any Place. *Uſeful for ſetting Watches in all parts of the World with the greateſt exactneſs, to correct Sun-Dyals; to aſſiſt in the diſcovery of the Longitudes of Places, &c. By the Reverend Mr* William Derham, *F. R. S.*

AMong all the ways contrived for finding the Meridian of any Place, the moſt commodious I could ever meet with, or think of for common Uſe, is an Inſtrument of Sir *Chriſtopher Wren*'s, or two of Mr *Gray*'s, or one publiſhed in the Appendix of a little Book, called *The Artificial Clockmaker.*

Sir *Ch. Wren*'s contrivance I am informed is thus, At one end of a Ruler, erect a Sight, to ſee the Pole-Star, *&c.* through. At the other end ſet up two Circles of ſmall Wire, one within the other; the Diameter of the innermoſt, equal to the doubled Tangent of the diſtance of the Pole-ſtar from the Pole, the diſtance of the Sight being Radius; and the Diameter of the outermoſt Circle, equal to the double Tangent of the diſtance of the next Star to the Pole-Star, from the Pole. Your Inſtrument thus prepared, if you look thro the Sight, and bring the two Circles to the two Stars, whoſe diſtances from the Pole they repreſent; a Line paſſing through a Sight and Center of the Circles, is the Elevation of the Pole: and two Plumb-lines hung up, one over the Sight, the other over the Center of the 2. Circles, will exactly lye in the Meridian of the Place.

Mr *Gray*'s Ingenious Contrivances being in the Philoſ. Tranſ. Nrs 268 and 270, I ſhall not need to give any deſcription of them, but refer to his own much better account.

The laſt Inſtrument is what I have made uſe of for ſeveral years (and was it not a violation of the Rules of Modeſty to ſpeak well of my own) I would recommend it, upon my own experience, for a very nice way to find the Meridian of any place, and to ſee the *Tranſits* of the Celeſtial Bodies over it, either Northward or Southward.

The Inſtrument is thus made of Wood, or rather Iron, or Braſs, to indure the Weather, without ſwelling or contracting, *viz.* Prepare a ſmall flat Iron Bar, as in *Fig.* 1. C. C. At each end of which Rivet on two upright Sights, to turn ſtiffly, at the Joynts I. I. Let one of the Sights *c. d.* have a perforation big enough to ſee the *Pole-Star* through it; the other Sight *a. b.* a very ſmall perforation, to ſee the *Sun* through. Juſt behind the Joynts fix two upright Arms C. D. & C. D, but to bend off, ſo as to be out of the way of the Sights, when you look through them. Theſe Arms ought to be long enough for the Plumb-lines to reach the Polar-Star, on one ſide; and the Sun at his greateſt height, on the other ſide, when you look through either of the Sights. The Plumb-lines therefore are Tangents to their oppoſite Sights, and their lengths may be found by a Table of natural Tangents, and making the diſtance of the two Sights Radius. Thus in the Latitude of *London*, if the Inſtrument be two feet from Sight to Sight, the Southern Plumb-line hath need to be near 4 feet, and the Northern Plumb-line about 2 feet 10 inches. On the tops of theſe two Arms place two ſmall croſs pieces D. E. & D. E. to turn with a Joynt at D. which Croſs-pieces are to hold the Plumb-lines E. F. and E. F. and to turn off and on, ſo as to bring the Plumb lines to the Sights exactly. Place this Inſtrument on a Pedeſtal H. to turn round on it ſtiffly at the Pin G.

Your Inſtrument being thus prepared, the way to *Set and Uſe it* is thus, Plant it in a convenient place, where the Polar-Star may be ſeen by Night, and the Sun by Day. When that Star is on the Meridian, is the time to ſet this Inſtrument, which is thus to be done; *viz.* Through the Sight with the larger Hole *c. d.* look at the Pole-Star, and turn the whole Inſtrument about, until you ſee the oppoſite Plumb-line nicely to interſect the Pole Star. Or when you have brought the Plumb-line near the Star, you may more eaſily bring the Plumb-line to interſect, by moving the Sight *c. d.* backward or forward, at the Joynt I, inſtead of moving the whole Inſtrument. And that you may more eaſily ſee the Pole-Star thro the Sight, let the Plumb-line be a very fine Cats-gut ſtring or Horſe-hair, *&c.* And if it be white, or ſome ſuch light colour, it will be the better ſeen, with the help of a Candle ſhining on it by Night; which is neceſſary.

The Sight *c. d.* and oppoſite Plumb-line being thus ſet in a direct line with the Polar-Star on the Meridian, it is manifeſt, that the Inſtrument lyeth exactly in the Meridian, ſo as to ſee any Star on the Meridian to the North. And that you may ſee the ſame Southerly; the next day, or when you pleaſe, you may hang up the Plumb-line E. F. upon the Southern arm C. D. ſo as that the Plumb-line may exactly interſect the Perforation *c. d.* This may eaſily be done by moving the top Joynt, with the Plumb-line on its Croſs-piece backward and forward, till the Plumb-line hangeth to your mind. If the Sight with the leſſer perforation *a. b.* be not exactly under the Northern Plumb-line, it muſt be brought to be ſo by turning the Sight, by help of its Joynt at I. And then all the Inſtrument is ſet right, ſo as to ſee the Sun, Moon or Stars come on the Meridian towards the South.

But to ſee the Sun tranſit the Meridian, it is neceſſary to guard the Eye, with a coloured Glaſs, or a Glaſs darkened with the ſmoak of a Lamp or Candle. Which, for the ſake of thoſe who do not know the way of it, it may be neceſſary to deſcribe.

A Glaſs to look upon the Sun.

Chuſe two pieces of Glaſs cut into the ſame ſize and figure. But take care they do not refract. Which may be known by moving the Glaſs before the Eye. If the objects you look on, ſeem to dance about, the Glaſſes are falſe and refract; but true if all ſeems ſteady. Smoak one of theſe Glaſſes over the flame of a Lamp or Candle, until it be obſcured enough to take off the Sun-rays ſufficiently, but not ſo as to darken it too much. This may be ſeen by looking upon the Sun with it, or upon the Candle. One of the Glaſſes being thus darkened, lodge them both together and faſten them in a little caſe fit for the purpoſe, with the ſmoaked ſide innermoſt, and an edging of Card between, to keep the Glaſſes aſunder, ſo as that the Soot may not be rubb'd off, or diſordered.

'Tis good to have two Glaſſes thus prepared, one for a ſtrong Sun; the other leſs darkened, for the Sun behind a thin Cloud, Miſt, or *&c.*

With one of theſe Glaſſes held behind, or before the Sight *a. b.* you mây plainly ſee the Sun paſs.

To imitate the aforeſaid Inſtrument in a Journey, or where-ever you come.

Inſtead of an intire Inſtrument, prepare only two Sights (as in Fig. 2.) with Perforations as before. Let theſe Sights be nailed or ſcrewed down, upon the tops of two Stakes at I. I, ſo as to turn ſtiffly upon them. The Plumb-lines (one at leaſt) may be hung up at the end of an Houſe (as at K. Fig. 2.) or on the bough of a Tree (if the Wind would not ſhake it) or any where you ſee fit. And the Sights muſt be ſtuck up, ſo as to bring the Pole-Star to interſect, and all be performed, as hath been before directed.

This, although in a manner the ſame with the Inſtrument before, yet is more convenient in ſome reſpects. Cheifly becauſe the Plumb-lines may be made longer, and the Sights ſet farther aſunder, than in the Inſtrument before can conveniently be done; which is ſome, altho no great advantage for ſeeing the Tranſits. Alſo, theſe Sights may be made ſo light, as to be eaſily carried about; or they may be eaſily made, or imitated in any place where-ever you come.

To know when the Polar Star cometh on the Meridian.

It is neceſſary I ſhould ſhew how this is done, for the ſake of ſuch as know it not, to whom the foregoing Inſtruments may be uſeful. The way is this; Subſtract the *Right Aſcention* of the *Sun* from the *R. Aſc.* of the *Pole-Star*, the *Remainder* giveth the Degrees, Minutes and

Seconds when the Pole Star tranſits the Meridian above the Pole. Divide theſe Degrees by 15, it giveth the Hours, and every Degree under 15 multiplied by 4, giveth the Minutes; and every Minute multiplied by 4, giveth the Seconds, of Apparent time of the Pole-Stars Southing. I ſcarce need to ſay that it cometh under the Pole at 12 hours diſtance, only making ſome ſmall allowance for the alteration of the Sun's R. Aſc. in that 12 hours time.

But you may ſhorten your labour, by uſing Tables of the Sun's R. Aſc. in *Time*, inſtead of his R. Aſc. in *Degrees*, &c. which may be found in Sr *Jon. Moor's Math. Compend.* and in divers other Books.

If the Sun's R. Aſc. exceedeth the Pole-Star's, add 360 degrees, or 24 hours, and then ſubſtract.

The R. Aſc. of the Pole-Star is determin'd by Mr *Flamſteed* to be 0h. 33'. 4". of *Time*, Anno 1690, and the increaſe of it's R. Aſc. in 10 years 1'. 16". of *Time*. Therefore this preſent year 1703, the R. Aſc. of the Pole-Star is 0h. 35'. 22'. of *Time*.

Or you may ſee when the Pole-Star cometh to the Meridian, by hanging up a Plumb-line, and obſerving when the *Thill-Horſe* in *Charles's Wain*, called *Alioth*; comes near the Line, together with the Pole-Star, on one ſide the the Pole; or the bright Star of the 3d Magnitude in *Caſſiopeia's Thigh* on the other ſide, as is repreſented in Fig. 3.

The foregoing Inſtruments may be ſet by any other Star, as well as the Pole-Star. But the Pole-Star in our Northern Hemiſphere, is moſt convenient, becauſe it maketh but a ſmall circle round the Pole, and therefore moveth ſlower, and conſequently is longer in tranſiting the Meridian. And therefore a ſmall error in calculation, or a little expence of time in ſetting the Inſtrument, may be admitted, as little deſerving regard.

The

The Uſes of theſe Meridian Inſtruments.

I. You may ſee with all imaginable exactneſs, when it is *Noon* even to 1, 2, or at moſt 3 Seconds of Time. For you may ſee when the very Limb of the Sun toucheth the Meridian, and whilſt all his Disk is paſſing it. So that by much it exceedeth all Sun-Dials: ſo far that if you once uſe this Inſtrument, you will be ready to lay aſide all Sun-Dials; the beſt of which (unleſs we except Mr *Molineux*'s) can never ſhew the Time to one or many Seconds.

But beſides all this, another vaſt conveniency is, That it will *fit moſt Latitudes.* So that there is no need of having a ſtrict regard to the Elevation of the Pole, nor any danger of error in making and ſetting, as is in moſt other Inſtruments, but all is with eaſe and certainty performed. Therefore,

2dly, Into whatſoever place you come, you may eaſily ſee the Errors of the Sun-Dials there, and which go trueſt, and which falſe.

3dly, As the Sun, ſo alſo the fixt Stars may be ſeen to tranſit the Meridian, whereby the *Hour of the Night* may as exactly be known, as of the Day by the Sun, knowing the R. Aſc. of the Star that tranſits. For (as before for the Pole-Star) ſubſtract the R. Aſc. of the Sun from the R. Aſc. of the Star, the Remainder converted into Time, is the time of that Star's Culmination or Southing. And if 12 hours be added or ſubſtracted (making due Allowance for the alteration of the Sun's R. Aſc. in that time) it ſheweth the exact time of that Star's coming to the Meridian Northward.

4thly, The Hour of the Day and Night being thus to 1, 2 or 3 Seconds diſcoverable by the aforeſaid Inſtruments, I doubt not but that they may be uſeful in finding the exact *Differences of Meridians*, either by the *Eclipſes* of *Jupiter*'s *Satellites*, or the *Occultation of the Fixt Stars by the Moon.*

I do not pretend that theſe Inſtruments are any otherwiſe uſeful in finding the Longitude, than by ſhewing the exact time of the Day or Night; which is one thing abſolutely neceſſary in this matter. Neither indeed will they ſerve without a well adjuſted Pendulum-Watch, or Pocket-Watch, that will keep time exactly from one obſervation by the Meridian-Inſtrument to another. Nor indeed are they uſeful on Shipboard, but only on Land, where they may remain fix'd. But on Head-lands, or any where on Shoar, they may be uſeful to the Seaman. And indeed (until better diſcoveries are made) theſe Meridian-Inſtruments may be of uſe, where-ever long Teleſcopes can be uſed, for ſeeing the Appulſes of the Moon to the fixt Stars, or the Eclipſes of *Jupiter*'s Satellites; which is only on Land. Unleſs (which I have thought feaſible) a convenient Standing for a Man, and a Teleſcope might be hung pendulouſly in a Ship, which (eſpecially in a calm Sea) may be as little ſubject to diſturbance, as the Pendulums of Watches are, which will retain their motion at Sea.

5thly, You may with all exactneſs continue a Meridian Line for many miles, by looking thro' either Sight, and ſeeing what Objects are interſected by the Plumb-lines.

6thly, Theſe Inſtruments are prepared with little coſt, or trouble: and eaſily carried about, or imitable in any Place, the latter eſpecially, which may be made pocketable, or ſoon gotten.

IV. *A Supplement to the account of the* Pediculus Pulſatorius, *or* Death-Watch, *in Philoſ. Tranſ.* No 271. *Serving to the more perfect natural Hiſtory of that* Inſect. *By the Reverend Mr* W. Derham, *F. R. S.*

THe *R. Society* having ſo favourably received my former Account of the *Death-Watch*, as not only to publiſh it, but to require alſo my perfecting the Hiſtory of that Inſect, I think my ſelf bound to comply, as far as I am able. And therefore I have procured a Draught to be made of that Inſect, both as it appeareth to the naked Eye, and as magnified with a Microſcope. [Fig. 4.] ſheweth it as ſeen with the naked Eye: [Fig. 5.] as magnified.

Theſe Figures, and only ſaying, it is very much like a *Louſe* in Shape and Colour, but runneth more nimbly, may be a ſufficient deſcription of an Inſect common in every Houſe, in the warm months. For in the cold ſeaſon of the Year, they hide themſelves in dry obſcure places, and are ſeldom ſeen.

Of the Generation of the Death-Watch.

Some time after their Copulation (of which by and by) they lay their Eggs in dry, duſty places, where they meet with leaſt diſturbance. For in ſuch, and none elſe, I have found them. Theſe Eggs are exceeding ſmall, much ſmaller than the Nits of Lice; although Lice are not much bigger than our Inſect is. Theſe Eggs are white and ſhap'd like Nits, but more tranſparent.

Theſe (as the Eggs of all Inſects that have fallen under my cognizance, are by the warmth of weather) theſe, I ſay, are hatched by the warmth of the approaching Spring, which is to them all one as an Incubation. About the beginning of *March*, or (if the weather be warm) ſooner, if cold and unſeaſonable, later, the Inſect is fully hatched, and can creep about.

At the firſt leaving their Egg-ſhell, they are exceedingly ſmall, ſo as ſcarce to be diſcerned by the ſharpeſt Eye, without the help of a Convex-Glaſs. I have with a Microſcope ſeen them crawling about, but could ſcarce perceive any Hairs, Feet, *&c.* But they rather look'd like moving Eggs. I ſuppoſe they were covered with their Shells, and but juſt breaking out of them. At the firſt leaving their Shells they are leſſer than their Eggs, altho the Eggs are ſcarce viſible without a Microſcope.

Theſe young Death-Watches are perfectly like the Mites in Cheeſe, a few hairs of the Breech only excepted. I could not perceive any difference between them, when much magnified with a Microſcope, but only that Mites have more Briſtles about their Breech.

In this Shape they continue 6 weeks, or 2 months, feeding on divers things they can meet with. They being (as I ſaid) ſo very like Mites, I cannot poſitively ſay, but have great reaſon to think, that they were ſwarms of young Death-Watches, which I have ſeen feeding on dead Flies, and other things in *March*, *April* and *May*. Indeed they are a great annoyance to me, in devouring or defacing my Specimens of Inſects. And there are ſcarce any ſorts eſcape theſe voracious, tho minute Animals.

From this *Mite State*, they grow gradually to their more *perfect State*. When they become like the old ones, they are at firſt very ſmall, and then can run about more ſwiftly, than when Mites, in which Mite-ſtate, they creep but ſlowly.

Thus having traced the Generation of our Inſect, through its ſeveral ſtages, and finding it to be as ſolemn and regular as any in Nature, even as that of an humane *Fœtus* it ſelf, I cannot eaſily paſs over the buſineſs of *Æquivocal Generation* without a reflection. If this Inſect was ever taken notice of by the Ancients (as I do not find it was, either by them, and but little by the Moderns) they would, no doubt, have made its Production to be (like that of other Inſects, *viz.*) out of Duſt, or ſome other thing, in which its Eggs were laid. But as in this, ſo in the Generation of all other Inſects, yea all Animals, it hath been obſerv'd, that Nature is very regular, and uniform, in deriving the Off-ſpring, not from corrupted Matter, but from Animal Parents of the ſame Species. The Digreſſion would ſcarce be pardonable, or I ſhould hardly forbear expatiating on what I have often with great Pleaſure and Admiration ſeen of Natures procedure in the Generation of Inſects particularly; as for inſtance, *Gnats*. 'Tis wonderful to ſee in what curious and exact order the ſeveral Species of Gnats lay their Spawns. The curious and ingenious *Swammerdam*, and other Authors mention but two kinds of Gnats, but I have collected near 30 diſtinct Species of them, and have obſerved one Species to lay its Eggs in this, another in that, another in a third, and others in other Forms; and I could not but admire to ſee how artificially the Spawns are tied in the Water; how (after the Sun's Incubation, if I may ſo call it) the Spawn is diſſolved, and the Eggs, with a part of the Gelly in which they were incloſed, fall to the bottom of the Water, and there ſtick on Stones and other things; where they are hatched into *Nymphæ*, as various as the Gnats themſelves, ſome being red, green, white or other colour'd Worms, ſome of quite a different Shape: and laſtly, how theſe *Nymphæ* become *Aureliæ*, and then *Gnats*, both *Male* and *Female* of every Species.

But I find I am gotten into the Digreſſion I propoſed to avoid, and therefore (begging pardon) I ſhall return to our *Death-watch.* And the next point I ſhall conſider, ſhall be

Of the Noiſe, or Ticking, and Copulation of the Death-watch.

In the Tranſaction before named, I have plainly ſhewed their *Ticking* noiſe to be a *wooing Act*, and that it is commonly about *July.* I ſcarce ever heard them beat before *July.* But all, or the greateſt part of *July* they beat, and in the beginning of *Auguſt.* I have heard them till *Aug.* 16. but never later. But they do not every year beat alike; but ſometimes ſooner, ſometimes later; ſometimes much, ſometimes little; according as the year exciteth or favoureth, or hindereth their venereal inclinations. Of which we have ſufficient example in the laſt, and preſent year. The laſt year 1702 they ticked very much, ſcarce ever ceaſing either day or night. But this year 1703 as little. And I have obſerved as great a difference in the fertility of other Inſects the laſt, and this preſent year. And no doubt but the ſame befell our *Death-watch.* The moſt remarkable Difference, or at leaſt the moſt perceivable was in Inſects bred in the the Waters. Of which I ſhall ſay a little, becauſe it ſerveth to illuſtrate what I am ſaying about the *Death-Watch.*

Now as to the Waters, it might be obſerved, that laſt year they extreamly abounded with Animalcules. You could hardly find any ſtagnating Water without many Animalcules of many ſorts therein, viſible even to the naked eye. And if you viewed but a ſmall Drop thereof with a good Microſcope, you might ſee very many more. So that the Water looked in a manner as if alive.

But this year I have found ſome, but very few of thoſe Animalcules, either without or with a Microſcope. The

Pediculi Aquatici (which *Swammerdam* calls *Pulices Aquatici Arboreſcentes*) which are ſeldom barren, were for inſtance leſs numerous in our Waters this laſt Summer, than the Summer before, by many myriads, or at leaſt leſs venereally inclined, or leſs pregnant, as I judge, from their being vaſtly leſs numbers of them congregated together. For the reaſon of their aſſembling in ſuch vaſt numbers, ſo as to diſcolour the Waters, I have diſcovered to be either for Venery, or to diſcharge their young at leaſt out of the Receptacles wherein they were lodged, or to caſt their *Exuviæ*, or Skins, or for all together. For I have ſeen all theſe things performed at that time, if I miſtook not.

Now as theſe moſt numerous fertil Inſects, ſo our *Death-Watch*, in all probability, had its venereal Flames abated by the Indiſpoſition of the preſent Year; and conſequently (as I ſaid) have clicked but little this year.

The reaſon of all which I take to be the Wet of the Spring-months, eſpecially *May* and *June* laſt. In the former of which, there fell more Rain here at *Upminſter*, than in any month of any year ſince 1696. This vaſt Wet might not only chill and ſpoil the Eggs of the Water-Inſect, but alſo indiſpoſe the Air, and by ſome ſuch means affects all other Inſects, and render them leſs Prolifick.

And not only Inſects, but even Corn it ſelf, we have, to our coſt, found to be leſs fruitful than than the Winter before gave us hopes of.

But 'tis time to leave this long, and I fear tedious account of the Noiſe of the *Death-Watch*, and proceed.

After that they have ſpent ſome time in terrifying their puſillanimous Hearers, and entertaining themſelves with their Hymeneal Muſick, they *copulate*. I do not remember that I ever found them in *Copulation*, till a week or fortnight after their *Ticking*. But 'tis very probable that they do copulate in the time of their *Ticking*, as I have formerly ſhewn the *Scarabæus Death-Watch* to do.

Of the Food of the Death-Watch.

I have already ſaid that the young *Death-Watches* feed upon dead Inſects, and the ſame I have ſeen the old ones do alſo, as alſo upon divers other things, *viz.* Bisket, Tallow, *&c.* nay, *Duſt* it ſelf (although it may ſeem to us an improper Food for ſuch Animalcula) doth not eſcape the Palate of our *Death-Watch*. For which reaſon probably it is, that they delight moſt in duſty places, not in all, but ſuch as are fouled with light Duſt, ſuch as flyeth in ſweeping, and falleth on Shelves, and other places ſeldom bruſhed down.

But in this their eating *Duſt*, there is one thing I have obſerved, which to me ſeems very remarkable, *viz.* their curioſity in chooſing it. For they do not eat all that they meet with, but are very nice, and curious in ſelecting what ſuiteth beſt their Palate. I have ſeen them turn the Duſt, and hunt among it with great pains and diligence.

From hence I conclude, that our *Death-Watch*, and other Creatures too that eat Duſt, are not nouriſhed by the pure terrene particles of Duſt, but rather by more nutritive particles intermixed with Earth. For Duſt contains very different particles, ſome of Earth, ſome the Powder of Animals, ſome Crumbs of Bread, Cheeſe and other Proviſions reduced to Powder, ſome particles of Fruits, or our Spittle, Snot, *&c.* dryed and reduced in like manner to Powder. Now theſe very Particles of the Duſt, are doubtleſs what the *Death-Watch* hunteth after (like Ducks in Mud) when he turneth up, and diveth among heaps of Duſt. Nay, ſo far probably is his Food from being corrupted, or fouled by the terrene particles, that it is perhaps better prepared, by thus being in Duſt. Before in a Maſs, in the body, it was more ſolid, and required the trouble of being gnawed out and maſticated, but being thus in Powder, it is ready ſubtilized fit for deglutition.

And although Duſt to us ſeems to be nothing but Dirt pulverized, or if conſiſting of ſuch Particles alſo as I have ſaid, yet to be ſo blended and mixed with Dirt, as to be inſeparable. But yet it is otherwiſe with our Inſect. I have ſeen them through a Microſcope, ſelect the particles of Duſt, and eat ſome and reject many others: Which they can eaſily do, being ſmall themſelves, and having accurate Organs of Sight, Smelling and Feeling, as well accommodated to Duſt, as the Organs of Ducks and Hogs are to find their Food in Dirt.

From this account of the Food of the *Death Watch*, I cannot forbear digreſſing again, to note a common error about the food of ſuch Creatures, as have been, or are thought to live upon things ſcarce nutritive of themſelves. Thus the *Chamæleon* was thought to live upon the Air, when Flies are eaten by him: Fiſhes to live upon Water, or at leaſt to ſatisfy a perpetual thirſt therewith; whereas their ſucking Water is breathing, and their Food as little of Water perhaps, as other Creatures uſe. So *Earth-Worms* doubtleſs eat Earth, but in all probability it is Earth made of rotted Roots, Plants, or ſuch nutritive things, not pure Earth. Nay, ſo neceſſary is good ſubſtantial Food to all Animals on this our Earth, that I am of opinion (from I think very good Reaſon) that there is no Animal but what hath its proper Food, even the moſt minute Inſects whatſoever, and that alſo none of the four Elements, although therewith mixed. Concerning which (to ſave the trouble of enlarging this digreſſion) an inſtance of mine may be found of the *Food* of *Water-Animalcules*, which my very ingenious and learned Friend *Mr Ray* hath thought fit to publiſh this year in his late Edition of his excellent Book, *Of the Wiſdom of God manifeſted in the Works of the Creation*, p. 431.

But to return to the Food of our *Death-watch*, or rather the time they abſtain from Food; which I ſuppoſe they do all the Cold Months. You may perceive them gone into their *Latilula* very ſoon; as ſoon, or ſooner than the Swallows, where, doubtleſs, they live all the Winter without Food, as many other Animals do.

I ſaid before they harbour all Winter in dry obſcure places; I have found them lying deep in undiſturb'd Duſt, but never in ſhallow Duſt, as tho they had a foreſight of the danger and inconveniences of cold Froſty weather.

Thus, in obedience to the commands of this Auguſt Society, I have (as far as I can) compleated my former account of the *Death-Watch*. But I fear I have treſpaſs'd upon your patience too much by the length of this Narrative, and therefore think it time to conclude. But only I deſire a word or two more, in anſwer to ſomething I met with, ſince my penning this, in the *Athenian Oracle*, which I think my ſelf oblig'd to take notice of. In the Queſtion 'tis plainly the noiſe of the *Pediculus Pulſatorius* which is deſcrib'd. But the anſwer is by no means right. The ingenious Gentlemen of that Society ſay, They enquir'd into ſuch a Noiſe, found a little hole eaten in the Wall, that with a Paper Trap they catch'd the Inſect, which they concluded made the Noiſe, and that it was a ſmall ſort of Spider. But I have been my ſelf ſo often impos'd upon in the ſame nature, before I actually ſaw the truth, that I aſſure my ſelf thoſe *Athenian Gentlemen* were ſo alſo. I have in hunting the Noiſe ſometimes diſcover'd a Spider near, ſometimes the ſmall *Scarabæus lignivorus*, which eateth the little holes in the Wood, which hath been commonly taken for the Death-Watch. Theſe I gueſt might make the clicking noiſe, and therefore with all nicety watch'd them. But found that altho the beating continu'd, the Inſects did not ſtir in the leaſt, nor were any way affected: So with all diligence I ſtill purſu'd my enquiry, which was the cauſe of my diſcovering the real thing. And I have ſo many years acquainted my ſelf with all the noiſes of the Death-Watch kind, that (altho I ſeldom love to ſpeak confidently, yet) I can aſſure every one that there are but two ſorts of them in thoſe parts of *England* where I have been, *viz.* the few quick beats of the *Scarabæus Sonicephalus* (as *Swammerdam* hath nam'd it) deſcrib'd by Mr *Allen*; and the longer and more leiſurely Beats of that Inſect I have now been ſpeaking of. There are indeed *Scarabæi* Graſhoppers, Crickets, *&c.* which make peculiar noiſes. But there are no Creatures which make theſe regular clicking noiſes (like the Beats of a Pocket-Watch) but only that *Scarabæus Sonicephalus*, and our *Pediculus Pulſatorius.*

IV. *Defectus Lunæ Obſervatio, die Solis* 12° *Decembris, habita prope Mercatorium Regium Londini, a J. Hodgſon R. S. S. tempore matutino, A.* 1703.

Parato Teleſcopio pedum duodecim longitudine eoque ad altitudinem idoneam ſublato hora quarta matutina, non levis mihi affulſit ſpes, fore, ut ipſum Eclipſeos initium perciperem, quia etſi Cœlum non plane eſſet ſerenum, Nubes tamen adeo erant tenues ut ipſum Lunæ limbum facile cernerem, & per intervalla quædam præcipuæ Lunæ maculæ diſtincte conſpiciebantur; ſed 20 min. aut circiter poſt quartam denſæ nubes obortæ ſunt; quæ cum ferrentur a plaga Cœli quæ eſt inter occidentem & Auſtrum, verſus partem oppoſitam ita Lunam obtexerunt ut mihi nullomodo conſpicua fuerit niſi 35 min. poſt quartam tunc enim inconſpectum meum redijt.& mihi viſus eſt tantus ab Orientali ora defectus quantus fieri potuit 3 aut 4 minutis horariis ab ingreſſu primo in umbram numeratis; ejus maculas ſat diſtincte percipere non potui, ad decernendum qua parte illa diliquium pati cœpit, nec licuit per tempus Eclipſeos quantitatem dimetiri; ſed 4 min.

poſt 5 quantum conjectare potui illa ſex fermè digitorum ſpacio obſcurata fuit. Eam vidi per intervalla uſque ad horam quintam cum 35 min. quo tempore deerant ad ſummum 3 min. à totali ejus immerſione, tunc autem parva Nubes ſed denſa ita Lunam operuit, ut eam amplius non viderim & quamvis maxime intentus fuerim, ut ſi fieri poſſet ejus Emerſionem viderem nullomodo mihi licuit tum ob craſſitiem Vaporum qui erant circa Horizontem, tum ob diei adventantem lucem eam oculis cernere. Ab initio uſque ad tempus Immerſionis Luna mihi conſpicua facta eſt pluſquam Vigeſies, ſed propter intercurrentes Nubes, & breve temporis ſpatium quo eam intueri licebat penes me non fuit quidquam exacte, ſatis definire at quamvis hæc Obſervatio utilis valde eſſe non poſſit ad Lunarios numeros expendendos, illa tamen ſufficit ad curioſis ſatisfaciendum eoſque convincendum illos numeros non multum a vero aberrare.

VI. *An Extract of a Letter from Mr* Ralph Thoresby, *F. R. S. to Dr* Nehemiah Grew, *Fellow of the College of Phyſicians and R. S. concerning a Ball voided by Stool.*

A Poor Apprentice Girl at *Rawden*, 4 miles from *Leedes* in *Yorkſhire*, about 14 years of Age, having been tormented with Colical, and, as was ſuppos'd, Nephritick Pains for ſome time; at length voided a roundiſh Ball, *per Anum*, as hard to feel upon as a Stone.

After a while, the Pains returning with greater violence, ſo as to make her roul upon the ground, ſhe voided another as hard, and much bigger.

Upon which, one Mrs *Ward*, a neighbouring Gentlewoman, who had been much afflicted with Gravel, gave

her ſome of thoſe Medicins which ſhe us'd to take her ſelf. Whereupon the Girl voided a third Ball, alſo *per Anum*, with leſs pain, yet the greateſt of the three.

The firſt of theſe Balls is ſmooth and gloſſy, of the colour of a right Hazel-nut, 3 inches about, and ſomewhat compreſſed. The other two rough and gritty, and in like manner a little compreſſed into a kind of obtuſely triangular figure. The 2d, is 4 inches and a half round about; the laſt, 5 inches and a half.

Conſidering their bulk, all 3 are very light, eſpecially the 2 latter and greater ones, of which the laſt weighs but 5 Drams 36 Grains; and both of them ſwim in water.

This lightneſs proceeds from the Matter whereof they conſiſt; which, in ſome places is purely Downey or Fuzzy; in others, mixed with a Gritty ſubſtance, yet not confuſedly, but regularly mixed. The Fuzzy parts poſſeſt the central part of the Ball, with a ſmall particle of blackiſh Glaſs or other Vitrify'd ſubſtance in the very Centre it ſelf. Over which are ſeveral Coats, gritty and fuzzy, alternately ending in the circumference with a grit, much reſembling the Ground-work and Superſtructure of the Oriental Bezoar-ſtone.

The Powder of one of theſe Balls ſcraped off with a Knife, is no way mov'd or affected with any ſort either of Alcaline or Acid Liquor dropp'd thereupon. Neither being burn'd doth it ſtink, it conſiſteth therefore of no Animal ſubſtance; but the Girl being of the Green-ſickneſs age, the gritty parts (with the glaſſy particle in the Centre, as the moſt ponderous and leaſt moveable) ſeems to be broken off of Tobacco-Pipes, and grownd ſmall between her Teeth; the downy or fuzzy to be lick'd or ſcrap'd off the Lean of Mutton, or the Rind of Peaches, or ſome other Part or Plant. Her Stomach kneading the Matter into a Coat, as her changeable Appetite ſupply'd it alternately with one or the other ſort.

VII. An

VII. An account of Books. 1. *Epiſtola D. Guilhelmi Muſgrave, S. R. S. ad Editorem miſſa, in qua ratio redditur libri nuper editi, cui titulus, De Arthritide Symptomatica Diſſertatio. Auctore Guilhelmo Muſgrave, M. D. Inclyti Medicorum Londinenſium Collegii, & Regiæ Societatis Socio, in* 8vo.

DE Experimentis meis, cùm ipſa jubeat Pietas rationem aliquam *Regiæ* me *Societati* reddere; jam poſt intermiſſum aliquamdiu commercium Epiſtolare redditurum merito expectes. Quare per nuperos hoſce dies quid in re Medicâ notaverim, quid etiam lucubraverim, quando ad Scientiam naturalem promovendam, pro tua humanitate id tibi conferre videatur, en paucis accipe.

De *Arthritide* ſcribentes, quorum ego Libros pervolvi, omnes in eo laborarunt, ut Morbi iſtius qua *Exquiſiti, Primarii* & *Genuini* Doctrinam excolant & Diſciplinam edant; de *Secundariâ* ſive *Symptomaticâ Arthritide*, parum vel minimè ſolliciti. Qui quidem eorum Error quodnam exſtiterit in evincendâ *Arthritide* impedimentum, quas moras fecerit, quantoq; fuerit Humano Generi incommodo, vel ex eo conſtat, quòd *Arthritis exquiſita* ſui generis materiâ, eâq; ſine Morbo præcedente ullo Paroxyſmos celebrante, tum etiam propriâ gaudeat Curatione: E diverſo manifeſtum eſt, *Arthritides Symptomaticas*, nullam habere ſibi peculiarem, ſed vel *Arthritidis Primigeniæ* materiam, vel ab aliquo præcedente Morbo, quem *Primarium* dicimus derivatam; ſemper autem a *Primario* Morbo eas in Paroxyſmos evehi, propriaſq; Curationes ſemper poſtulare: Unde palam eſt, quantum illi fuerint hallucinati, qui dum uni eidemq; tantum Morbo, nempe *Arthritidi* Medicinam facere ſibi viderentur; revera multis, iiſque inter ſe diverſis, diverſaq; ratione impugnandis facerent.

Ut in iſtâ Medicinæ parte quod deeſt, pro virili ſuppleam, *Arthritidis* in *Primigeniam* & *Symptomicam* diviſionem itemq; *ſymptomaticæ* in ſuas *Species* deſtributionem, religioſiſſime ante omnia conſervandam propono.

Eum recte curaturum credunt, qui rationalem Medicinam profitentur, quem prima Origo Cauſæ non fefellerit: neque curari id, quod ægrum eſt, poſſe ab eo qui quid ſit ignoret.

Quid quod Doctiſſimum *Mortonum* in *Phthiſiologiâ*, non ſine Gentis Medicæ approbatione & applauſu, diſtinctione ea utentem legimus; iſtiuſque operâ Morbum difficilem luculenter explicari, graviſſimum fœliciter curari.

Hunc ego Choragum ſecutus *Arthritidem* dico *ſymptomaticam*, in eâque *Species*, quotquot uſquam mihi innotuere, comprehenſas. *Illius* ratio generalis in eo locatur, quòd cum Morbi ſint ab *Arthritide Primigeniâ* diverſi, & intervallo quodam diſtantes, Stationes Primarias linquant, & erga *Arthritidem* moventes ei paulatim appropinquent. De appropinquandi modo ut recte cogitemus, Primarii Affectus Exuviæ, ſive collapſa ſymptomata, ſimul cum *Arthritidis* uſurpato *Primigeniæ* Vultu, *Arthritides Symptomaticas* certiſſimè commonſtrant.

Harum ecce recenſionem!

- Arthritis
  - Primigenia
  - Symptomatica
    - Falſo ſic appellata, quæ Rheumatiſmo,
    - Minus proprie dicta, quæ Chloroſi, Hydropi,
    - Magis propriè dicta, quæ Melancholiæ, Scorbuto, Lui Venereæ Aſthmati, Febri, Colicæ, Morbis quibuſdam Cuticularibus,
    - ſuccedit.

Rheumatiſmo ſuperveniens *Symptomatica*, falſò & ex vulgi tantum opinione dicta *Arthritis*, Paroxyſmos ad morem *Arthriticum* habet omnino nullos; nec Materiam ei, quæ eſt *Arthritica* ullâ ex parte comparem, ſed a viſcida quadam materia ductus exiguos implente eoſque diſtendente proficiſcitur. Quìd huic Γλισχρότητι ſit in cauſa exquiritur, & tandem vel a Calore Frigoreque vehementibus & continuis, vel ab Sale Alcalico in ſanguine retento, vel ab utroq; eam oriri, tanquam probabile, declaratur.

Arthritis ex *Chloroſi* eas tantummodo pallidas invadit, quæ Miaſmate *Arthritico* ſunt hæreditario imbutæ. *Chloroſi* abituræ ſupervenit, & ſimul cum Vultu colorato, cum Robore, cum Sanguinis Μετεωρισμῷ, iſtorum Symptomatum Societati ſe immiſcens, proſilit *Arthritis*. Cauſam habet conjunctam cum *Arthritide Primigenia* communem, a *Chloroſios* cauſa multum abludentem. Quamdiu vagatur hæc *Arthritis*, incerta ejus eſt Diagnoſis; ſed ex *Ægrotæ* Parentum morbis expiſcanda: Articulis affixa Dolore, Tumore, Rubore, ſed & iis pro augmento menſium minutis & declinantibus, ſe oſtendit. Medendi Judicatio ſingularis & præcipua requirit, ut per Muliebria ſanguis expurgetur;

getur; ſicq; *Chloroſi* & *Arthitidi* ſimul ſemelq; occurratur. Huic affinis ea, quæ ſteriles & Catameniis orbatis afficit *Arthritis*; excepto quòd a vitioſa plenitudine procreata Catharſi, eâq; tum crebro, tum forti, depellenda eſt.

Hydropi quæ ſuppullulat *Arthritis*, ita ſe plerumq; habet. Morbo iſti, ubi in humido omne vitium, & cum humidi quod abundat jam prius emiſſum eſt, maximè verò poſt *Amara* & *Chalybeata*, ſuccreſcendo emergit, & quidem auſpicato. Annos enim elargitur & valetudinem, ſi non optimum certè deſiderabilem: Quare omni ope & induſtriâ niti oportebit, ut auxiliis tum ad *Hydropem* propulſandum, tum ad *Arthitidem* invocandam idoneis, augeatur ea confirmeturque.

Ex *Symptomaticis magis proprie* dictis, prima utpote a *Primigenia Arthritide* remotiſſima, (nam a remotioribus orſi, ad eas, quæ magis vicinæ ſunt, gradatim deſcendimus) eſt *Melancholica*. Alienum id ac ἀνεπιτήδειον, quod in fiſtula alimentariâ ſpiritus, natura debiles, premendo *Melancholiam* peperit, jam in Artus propellitur, & *Arthritidem* parit *Symptomaticam*. Clementer ea ſe fere gerit, neque Paroxyſmos adeo atroces habet, ac reliquæ ferme omnes; & ea qui tenentur, in priſtinum affectum, nempe *Melancholiam* plerumq; cito revertuntur. Dignoſcitur hic Affectus, ſi Æger diu *Melancholia*, demum *Arthritide* laboraverit, & hac quò magis eò remiſſius illâ, maximè ſi hoc crebro acciderit. In ejus Prophylaxi, juvat alienum e ſanguine amoliri, ejuſque in primis viis regerminationi obſtare: tum ſpiritus levare, languentes ſuſcitare: quod quidem Aqq. purgantibus & Diureticis, Infuſo Teæ Chalybeatis, & Cortice Peruano perficiendum.

Melancholicæ proxima, ſed longo proxima intervallo, eſt *Arthritis* Ea, quæ *Scorbutum* excipit; Morbus certe apud *Damnonios* ingenio valde peculiari, propter *Scorbuti*, ex quo Emanat, ἦθος peculiare. Eſt enim is *Scorbutus* veteris iſtius *Lepræ*, quæ *Damnonium* univerſum paucis ante ſeculis perreptando graviter afflixit, ἐπιγέννημα. Hinc illæ frequentes Papulæ, Cutis ille pruritus intolerabilis, Color ille flammeus, Fervor importunus, Exanthemata, Lichenes, Squammulæ veteris ſcil. *Lepræ* reliquiæ, Ignis nondum penitus exſtincti Scintillulæ. Mites habet hæc *Arthritis* Paroxyſmos, & (quod ei proprium) Affectus Primarii Symptomata non pauca conſtanter retinet: Ut ex *Scorbuto Arthritico* ſcabie, maculis, Gingivarum vitiis, renitente licet Medicinâ, etiam dolente Articulo inficiantur. Calido iſti *Scorbuto* quæ ſubnaſcitur, *Arthritis* ſemper reperitur *Calida*: Τȣ̃ Πατρὸς τὸ Παιδίον. In Paroxyſmo, Materia Articulis impacta blande foras elicienda. Cane pejus & angue ſunt *Repellentia*. Extra paroxyſmum, evacuantibus, Materia peccans amandetur, alterantibus corrigatur, ne repullulet inhibeatur: Horum primum Mercurialibus, alterum Antiſcorbuticis cum Antiarthriticis una maritatis, Aqq. Diureticis, tertium Digeſtiviis attentandum.

Immoderata Venus ab antiquo *Arthritidem* accerſivit, verum maxime ex quo acceſſit ei *Lues*. Maturos hæc *Symptomatica* potiſſimum invadit. *Lui* ad *Arthritidem* tendenti calcar addit Empericorum Mos ille perniciofiſſimus, quo Puris ſuppreſſioni in curanda Gonorrhæâ properè nimis inſiſtunt hi Ardeliones, neglectâ vel remiſſe factâ Purgatione. Etſi *Luis* in *Arthritidem* mutatio ſæpe eſt in eodem corpore, tamen nonnunquam diverſa comprehendit, cum a Mariti *Lue Arthritis* in Uxore per concubitum accendatur. Hujus *Symptomaticæ* Dolor eſt Erraticus, & ob aliena iſta ſpicula acutus, nulli certe *Arthritidi* tam acutus, tam cito recidivus, tam ſimul longius duraturus. Quamprimum interciduntur Acceſſiones, aut multum remittuntur, ſi nulla fuerit evacuatio Materiæ, in caput ea ſolet transferri, & vel Apoplexian, vel Motus convulſivos excitare. In Paroxyſmo Dolor Paregoricis allevandus, ſed non niſi cum Cautelâ datis ne capiti materia impingatur. In vacationibus, a *Lue Venerea* mutuo ſumenda Indicatio: Antiſyphilicis, cum Evacuantibus, tum Alterantibus, ſanguis ttuendus, quem in finem aquæ proſunt *Bathonienſes*, & in noſtra vicinia *Bamptonenſes*.

Aſthmati ſuccreſcit *Podagra* creberrime *Pituitoſæ*, maximeq; ſi Medicinâ, (Catharticis ſcil. Δραστικωτέροις, & Antiaſthmaticis calidioribus) fuerit extimulata. Ejus Materiam diu in Ægroti corpore extitiſſe, Pituitâ videlicet involutam, & cum eâ per Sputum Κατ' ἐπίκρασιν externi credibile eſt. Aliis omnibus *Arthritidis ſpeciebus* hoc nomine *Arthritis* hæc *Symptomatica* Æſtate lætatur. Hyeme ab *Aſthmate* ſuperatur ſub ejuſque larva ſe abſcondit. Propterea quod illius materia frequenti expuitione magnam partem ejicitur, raro Tofos, aut Ulcera, aut Dolorem habet diutinum. In Epicenæ hujus *Arthritidos*, nunc Pulmonem, nunc Artus infeſtantis, Curatione in priore ſtatu ut Aſthma debelletur, Dolor Articularis excitandus; Venæ ſectio vel prorſus omittenda, vel quam in ſimplici *Aſthmate* oporteret ſanguis minori quantitate detrahendus. Catharſis Orgaſmum in ſanguine facientibus, ſed & iis rarius celebranda, ne videlicet Naturam *Arthritida* recte πας ἐξ υν ἐσαν deſiderantem, alio divertamus Materiam *Arthriticam* tum expellentia, tum evocantia, tum interne, tum externe adhibeantur. In altero vero ſtatu, quo propria perſonâ elucet *Arthritis*, ſtudioſius inſiſtendum, et, ſi flaccuerit excitandæ, ſi viguerit tuendæ ſervandæque. Natura enim ab *Aſthmate* per *Arthritida* ſibi cavet. In ejus dolore Paregorica propter ſpiritum difficilem, non temere propinanda. In hujus *Symptomaticæ* Prophylaxi, Ἀπεψίας fæces & reliquias Eccoproticis ſubinde datis amandare digeſtivis coctionem perficere, Diætæ rationem aptam proſequi expediet.

Febri interdum exquiſitæ, eiq; tam intermittenti quam continuæ, tam Συνόχῳ quam Συνεχεῖ ſuccedit *Arthritis*; nec quidem modo intellectu difficili, ſive per indomitum aliquid & Ἑτερογενὲς in ſanguine contentum, eumq; perturbans ſive propter obſtructas glandulas oriatur *Febris*. Ratione ortus, Multiplex eſt hæc *Arthritis*; ſemper autem, quo poſſumus ſtudio promovenda, nempe ut tenuetur *Febris*.

In hujus *Symptomaticæ* Prophylaxi, *Febris* cujus ea Germen eſt & Fructus, habeatur ratio, quæ quidem varia requirit diligenter attendenda.

Morbus Colicus hac in Regione frequentiſſimus eſt; & nunc a Bile, nunc ab acido Pomaceo, nunc a Dyſpepſiis ortus, *Arthritidem* habet frequenter Pediſequam. Quæ Proſapiæ prius dictæ eſt, ei medendæ preferenda Indicatio, qua externis quibuſcunque materia foras in Artus electetur. Hujus Curationis proprietas habeatur, auxiliis uti tantummodo externis, Cardiaca reſpuere interna & calida; ne incitata *Febre*, & mutatâ ſimul inclinatione Materiæ, Cerebrum ea, (quod jure quaſi avito facere ſolet) aggrediatur. *Colicæ* ex Pomaceo ſuperveniens, *Arthritis* dolorem habet valdè acutum, in *Colicam* facile recurrit, iterumq; *Arthritidos* perſonam induit, iterumq; deponit; raro Articulorum Nodis, Oppilationibus, Ulceribus eſt ſignata; quod ex Materiâ, partim per anum uſitate expreſſâ partim Inteſtinis affixâ, fieri credibile eſt. *Colicam* ex *Diſpepſiis* ortam, quæ ſequitur *Arthritis*, *Catharſi* fortiore, vel Cardiacis calidioribus ſolet excitari; & in *Colicam* iterum mutari, quoties Materia vel in inteſtina retrocedit, vel in primis viis de novo generatur; quorum alterum ſæpe & ex facili fit alterum quotidie. In hac *Arthritide* ſanandâ, Medicinam uti decet, nemo unquam exercebit, niſi *Colicam*, cui ea ſubjicitur, ob oculos poſuerit. Ubi in Poculis erratum, illud deponendum. Quod intus alieni eſt, per Aqq. purgantes expellendum. Dyſpepſia ut tollatur, Coctionis Ἐργαστήριον bene & crebro purgandum, Digeſtivis roborandum. Hujus tituli *Symptomaticis* hoc commune eſt, Quod eorum Paroxyſmi per Eccoprotica ſubinde iterata maxime vel præcaventur, vel ſaltem minuuntur; & quod omnium ſæpiſſime in affectum redeunt Primarium.

Morbis Cuticularibus, quales ſunt Achores, Hæmorrhoides, Ulcera, ſuccedit aliquando Podagra. In Morbis hiſce Primariis, Natura ineptum aliquid extra propellit.

Hoc ſi adauctum fuerit, Articulis ſæpe deponitur. Arthritico durante Paroxyſmo conquieſcunt Affectus Primarii, ſiſtuntur Evacuationes, exſiccantur Latices; eo ad exitium perducto, vel paulo poſt ſcaturiunt denuo, & quidem tantiſper novâ repullulante & urgente dum Materia, prælium redintegretur, & Λῆψις Arthritica revertatur. In Curatione Morbus quicunq; fuerit Primarius in totum alendus, *Ulcus* per Cathæretica, *Achores* per Attrahentia, *Hæmorrhoides* per Aloetica internè, per Hirudines externe adhibitas.

Habes Libelli noſtri Epitomen: Utinam ſane ei, quo te ſtudio & affectu proſequor; utinam ei qua Societatem obſervantia colo & revereor par inveniatur.

Vale in Augmentum Scientiarum, & illius memineris, quod ab *Hippocrate* ſcriptum eſt, Αγαθοῖσι δὲ Ἰητροῖσιν, αἱ Ὁμοιότητες Πλάνας καὶ Ἀπορίας. Iterum vale. *Iſſæ Damnoniorum.* Æquinoctio Verno, MDCCCIII.

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2. *Specimen Lithographiæ Helveticæ curioſæ, quo Lapides ex Figuratis Helveticis Selectiſſimi Æri inciſi ſiſtuntur & deſcribuntur, a Johanne Jacobo Scheuchzero, M. D. Figuri, 1732, 8vo.*

NOt only *our own*, but all the *Bodies* we converſe with and make uſe of, *Animals*, *Vegetables* and *Minerals*, riſe out of the *Earth*. Which therefore is a Subject of ſo great *Notice* and *Conſideration*, much to be wondred the *Ancients* ſhould have beſtow'd ſo little *Time* or *Thought* upon it; and the more becauſe many of them were ſo *exact* in the *choice* of what they were to treat upon. But *Georgius Agricola* was the firſt we know of, that

about 150 years ago attempted any thing to purpoſe on this ſubject. His living in a conſiderable *Mine Country*, and his great converſe with *Ores* and *Minerals*, gave him a mighty opportunity of advancing this *Knowledge*: And his *Learning* and *Diligence* were both very extraordinary. But the greater part of his Labour was employ'd in ſetting forth the Ways of working the *Mines*, of diſcovering and ordering the *Ores* of *Metals* and *Minerals*, and in endeavouring to aſcertain which particular *Sorts* of *them* the *Ancients* meant by *their Names*, rather than in clearing up the *Natural Hiſtory* of them. Not but that he made ſome Progreſs in *this* too, and very great for the time in which he liv'd, when *Natural Studies* were only in their *Infancy*: So great that *none* of the *Writers* of *Foſſils* ſince his time have come near him. Indeed the greateſt part *of them* have done little more than *copy* from his *Writings*. But of late there hath been ſuch a view given *the World* of the *Extent*, the *Uſe* and the *Importance* of this *Study*, as to have recommended it to the Purſuit of ſome of the moſt *diſcerning Naturaliſts* of the *Age*. Amongſt theſe is Dr *Sceuchzer* of *Zurich*, the Author of this *Specimen*, who along with *Real Learning* and great *Perſonal Abilities*, has ſhewn a vaſt deal of *Diligence* in his *Inquiries* into *this part* of *Nature*. That *City* has been very happy in producing *ſeveral*, who have bent *their Thoughts this way*. The works of *Conradus Geſnerus*, who was one of the greateſt Genius of the *laſt Age*, and *Jacobus Wagnerus's Natural Hiſtory of Switzerland*, are *Inſtances* of *this*. Every body knows what vaſt Mountains there are in *that Country*: and *Dr Scheuchzer* with indefatigable *Induſtry*, to ſay nothing of the *Expence* and of the great *danger* of ſuch an *Undertaking*, has carried his *Searches* and *Enquiries* to the *Tops* of the *higheſt* of *them*. And even *there* he found *variety* of *Sea-ſhells*, and other *Marine Productions*. But theſe have been alſo obſerved on the higheſt Mountains in other parts as well as here; which indeed cannot but be thought a *Thing* very ſurprizing and of great *Conſideration*, by all who duly reflect upon it. Along with the *Deſcriptions* of the *Bodies* here ſet forth, the *Author* hath cauſed *Icons* to be graved of *all* of *them*. The chief of the figured *Native Foſſils* he found in this Country, are the *Belemnites*, p. 25. 44. The *Selenita Rhomboidalis*, p. 49. and the *Fluor Chryſtallinus trigonus*, p. 29. He gives a remarkable Variety of the *Foſſil Corolloid Bodies*, ex. gr. *Corallium foſſile cortice reticulato*, d. 14. *Retepora ſeu Eſchara maxima Imperati Lapidea*, p. 13. *Alcyonium tuberoſum forma ficus vel quintum Dioſcor*, p. 17. *Fungulus pyriformis Lapideus*, p. 6. *Aſtroites*, p. 36, 39. Of the Sea Shells that he gather'd on *theſe Mountains*, the moſt *conſiderable* are the *Nerita*, p. 26. *Auris Marina Foſſilis*, p. 58. *Umbilicus Marinus*, p. 24. *Concha Tellinoides*, p. 21. *Conchæ Margaritiferæ fragmenta*, p. 55. *Conchula echinata*, p. 49. *Pectunculus parvus capillaribus Striis* notatus, p. 23. *Pecten denſe ſtriatus*, ibid. *Chamafoſſilis*, p. 55. In *this Shell* he obſerves there were diſcernible *the Veſtigia of the Muſcles by means of which the Animal adhered to the Shell*. Nor ought we to omit the *Echinus Spatagus*, p. 61. The *Aſteriæ*, p. 2. The *Entrochi*, p. 4, *&c. Two Joynts of the Claw of a Lobſter* ſtruck out of a piece of *Stone*, p. 27. And *a piece of a Shell of a* Crab, of that ſort that is called the *Molucco-Crab*, lodged in a *very hard ſort of Stone*, p. 65.

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3. *De Locis ſolidis ſecunda Divinatio Geometrica, in quinque Libros injuria Temporum amiſſos, Ariſtæi Senioris Geometræ. Autore Vincentio Viviani, Magni Ducis Etruriæ Mathematico Primario, & Regalis Societatis Londini Sodali. Opus Conicum in Lucem prolatum, Ann.* 1701. Folio.

THe Author *Vincentio Viviani*, who was 80 years old when this Book was publiſhed, and the laſt alive of the famous *Galileos* Scholars, was ever ſince the year 1642 employed by the great Dukes of *Tuſcany* in directing the Fortifications of their Dominions, overſeeing their Buildings, the banks of the Rivers, and other publick Works; ſo that he complained that he had not leiſure to proſecute his inventions in Geometry, that he made in his younger days, of which this Book is one.

As for his other Works they are theſe. In the year 1659. he publiſhed a Book in folio, intituled, *De Maximis & Minimis Divinatio Geometrica in Quintum Apollonii Librum*; and he wiſhes, that as *Apollonius*'s own fifth Book was found ſhortly after, ſo *Ariſtæus*'s Books may be found after the edition of this. That *Divinatio* is the reaſon why this Book, we are now to give an account of, is called *Divinatio Secunda.* In the year 1692 he publiſhed a Treatiſe in *Italian*, intituled, *Formazione e Miſura di Tutti i cieli*, in conſequence of an *Ænigma Architectonicum* he had, under a borrowed name, propoſed in the beginning of that year, in which divers learned men concerned themſelves. Theſe are all he has publiſhed in Mathematicks, beſides this Book, and two ſmall pieces, containing the ſolutions of ſome Problems propoſed by *French* Mathematicians. He dyed at *Florence*, *An.* 1703, and left a great many other Works, rather begun than perfect; but which, ſuch as they are, will no doubt be acceptable to the Publick, as coming from one of ſo great knowledge and reputation in Synthetick Geometry, and Mechanical Learning.

In the Preface to this Book he gives an account of *Ariſtæus Senior Geometra*, as far as can be gathered from the Ancients, and of his Writings. This *Ariſtæus* wrote *five Books of Conick Sections*, which *Euclid* himſelf valued ſo much as to imitate and add to them, as *Pappus* ſays. He wrote other *Five Books de Locis Solidis*, which are theſe that *Vincentio Viviani* pretends to reſtore. *Pappus* alſo ſeems to ſay that he wrote a Hiſtory of what had been done in Geometry until his time. And *Campanus* in an Annotation on *Prop.* 1. *Lib.* XIV. of the Elements, mentions a Book of *Ariſtæus*, intituled, *Expoſitio Scientiæ quinque Corporum*, from whence it may be inferred that he was of the *Platonick* Sect.

Tho the Author intended five Books, as *Ariſtæus* had written; yet he has publiſhed only three, and ſeems to deſpair of ever publiſhiug the other two.

Liber I.

In quo de locis Ordinationum conicarum Limitibus pertractatur.

This Book is divided into five parts.

Part 1. Are 34 Lemmatical Propoſitions, where are conſiderable eaſes in demonſtrating the properties of the Conick Sections from the *Regulatrix*; *Moduli ex Semirecto*, *ex verticali*, *ex laterali*; and in the Hyperbola from the *Modulus ex Aſymptoto*, *Triangulum circumactum a Symptotale*, *&c.* all which he there defines.

Part 2. Prop. 35. Shews that the *Altitudines Normalium* (or the *Subnormales*) in all the Conick Sections, erected from the points of the *Axis*, where the *Ordinates* are erected, are *ad Locum planum:* And Prop. p. 36 and 37, that the *Normales* to a right Line and a Circle erected as above (which is ever underſtood) are *ad Locum planum*; but in the 38 and onto the 42, that the *Normales* of the Conick Sections are *ad Locos Solidos*, which he there determines.

Part 3. Prop. 43. ſhews that in all the Conick Sections and Circle, the *Altitudines Normalium ſuper Ramos ex vertice* are *ad Locum Planum*; but from thence to the 49, that the *Normales ſuper Ramos ex vertice* are *ad locos Solidos*, which he there determines.

Part 4. In the firſt three propoſitions from the 50 to the 52 incluſive, he determines the *Locus Solidus* of the *Rami* from the Vertex of a Circle, or from an Origine betwixt the Vertex and the Center, or without the Circle. Prop. 53. he ſhews that the *Rami* from the *Focus* of any Conick Section erected to the Axis are *ad Locum planum* of a right Line there determined. In the following Prop. p. to the 58 he determines the *Loci Solidi*, made by the Ordination of the *Rami* of a *Parabola*, drawn from the principal *Vertex*, and from an Origine in the Axis betwixt the *Vertex* and the *Focus*, and below the *Focus*, and above or without the *Vertex*. In the next four to the 62 he determines the *Loci Solidi* made by the Ordination of the *Rami* drawn from the Origine in the Leſſer Axis of an *Ellipſis*; to wit, either the *Vertex*, the Center, betwixt the *Vertex* and Center, or without the *Vertex*. From the 63 to the 68 he determines the *Loci Solidi* made by the like ordination of the *Rami* upon the greater Axis of an *Ellipſis*. From the 69 to the 77 the like is done in regard to the *Hyperbola*, where there occurs a greater variety, as it is here managed. The next two Propoſitions are the like in the oppoſite Sections, where they ſuperadd any thing to what was before ſaid of one *Hyperbola*. And becauſe a Rectilinear Angle may be conſidered as an infinitely narrow *Hyperbola*, to wit, whoſe tranſverſe Axis is a point, in the 80 and laſt Propoſition of this Book he determines the *Locus Solidus*, made by the ordination of the *Rami* to this Angle, from an Origine in its Axis, either within or without the Angle. To this Book he ſubjoyns an Epilogue, containing ſome general Corollaries, uſeful, as he ſays, toward ſome things which he intended to publiſh; as that in a Circle the *Loci Solidi* made by the ordination of the *Rami* from an Origine in the Vertex, or within, are Parabolæ, which are all Lines like one another; and that the *Loci plani* ariſing by the ordination of the *Rami* from the *Focus* of a Conick Section or Circle are ſtrait Lines, which are alſo like Lines, and ſo in other caſes, that like *Loci* ariſe from ſuch applications.

Part 5. The firſt two Propoſitions determine the *Loci Solidi*, ariſing when the Tangents of the *Parabola*, intercepted betwixt the Section and either the Axis or the Tangent in the principal *Vertex*, are made *ordinates* to the principal Axis. And the next two determine the *Loci Solidi*, ariſing when the *Normales*, either to the Section, or to the *Rami*, proceeding from the principal *Vertex*, are made *ordinates* to the Tangent in the ſaid *Vertex*.

Liber II.

In quo Loci Ordinatarum potentium Limites indicantur.

In this he treats at large, in 71 Propoſitions, of the the *Loci* both *Plani* and *Solidi* ariſing from *ordinates* upon a ſtrait Line, whoſe Squares are equal to the ſumms or differences of the Rectangles and Squares of a Line, and its Segments and other aſſumed Lines, in all the variety and combinations thereof.

Liber III.

In quo Loci variarum diſpoſitionum Limites aſſignantur.

Here is the determination of the *Loci plani* and *Solidi* that ariſe from ſeveral ways different from the former. For example, if from two given points there be drawn ſeveral pairs of ſtrait Lines, whoſe Squares together be equal to a given Square, the concourſe of each pair is in the *Locus planus* of a Circle there determined. And (the other conditions remaining) if of each pair of Strait Lines one be drawn from a given point, and the other be perpendicular to a given ſtrait Line, the concurſe is in the *Locus Solidus* of an *Ellipſis* there determined. Afterwards there are ſeveral Problems concerning Arithmetical, Geometrical, and Harmonical mean proportionals betwixt two Extreams, and divers Methods for deſcribing the Conick Sections by points. There are alſo ſubjoyned ſeveral *addenda* to all the preceding three Books.

At the end of the Book are Prints of the *Orthography* and *Gate* of a *Stately Houſe* built by the Author *Vincentio Viviani* at *Florence*, with the Inſcriptions on the front thereof in honour of the *French King Lewis XIV*, from whom he had an annual Penſion for many years: and of the *Family of the Great Duke of Tuſcany*; and of his Preceptor the Famous *Galilæo Galilæi*, with a Print of *Galileo's Buſto in Braſs*, which is ſet over the Gate.

ERRATA. P. 1581. l. 22. after *refract* r. *vitiouſly*.

Printed for *Sam. Smith* and *Benj. Walford*, Printers to the Royal
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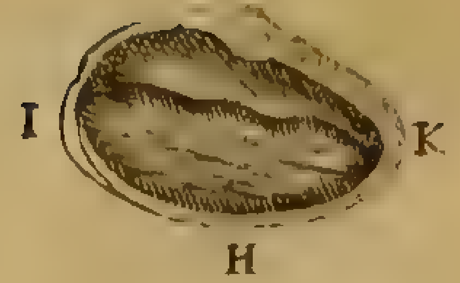

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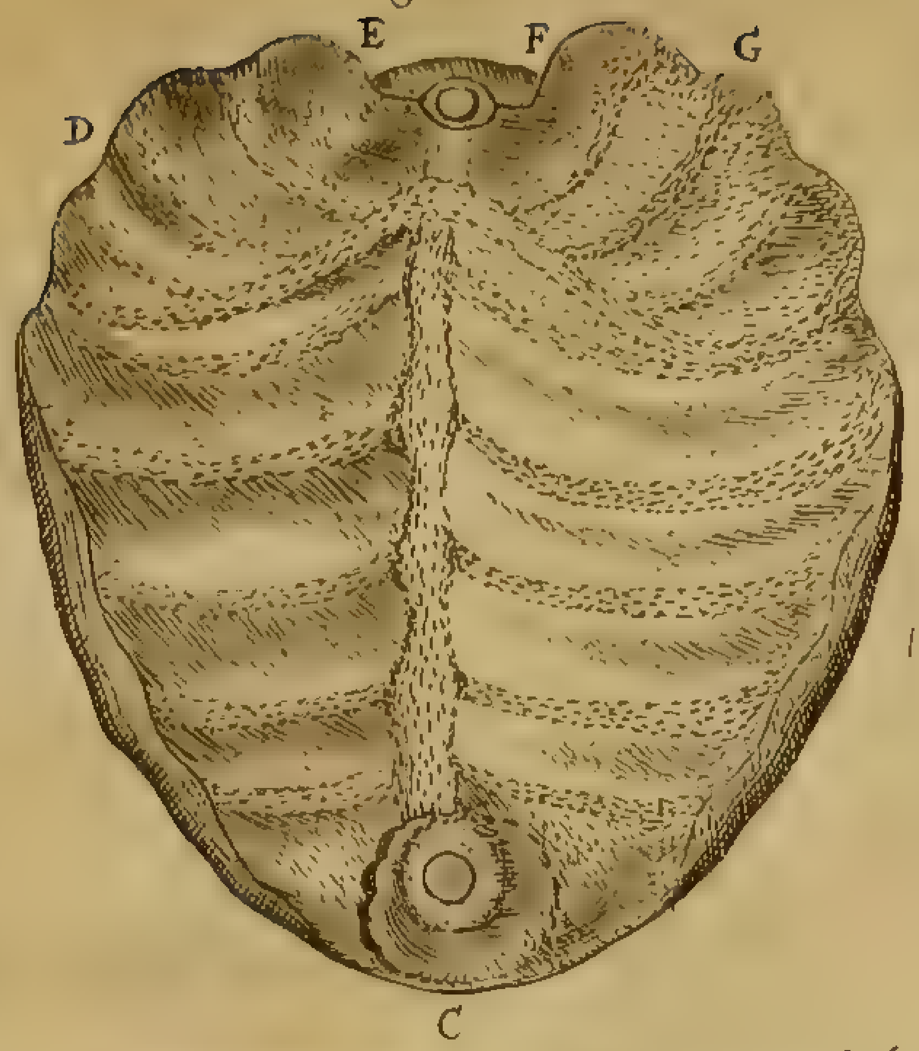

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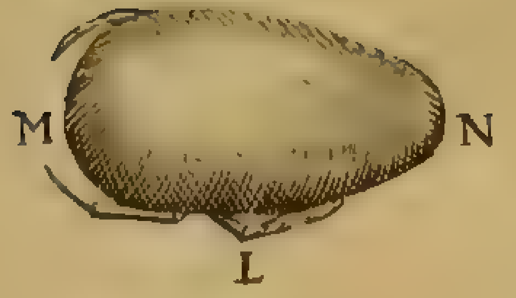

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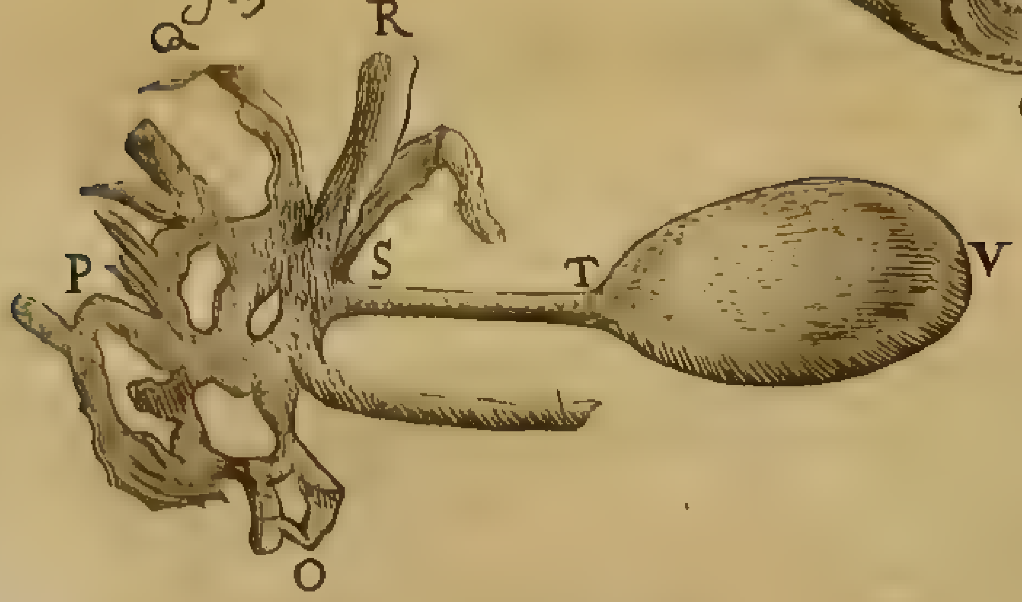

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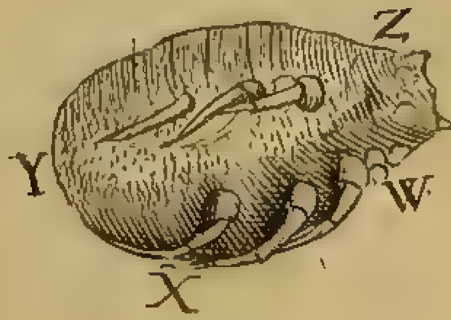

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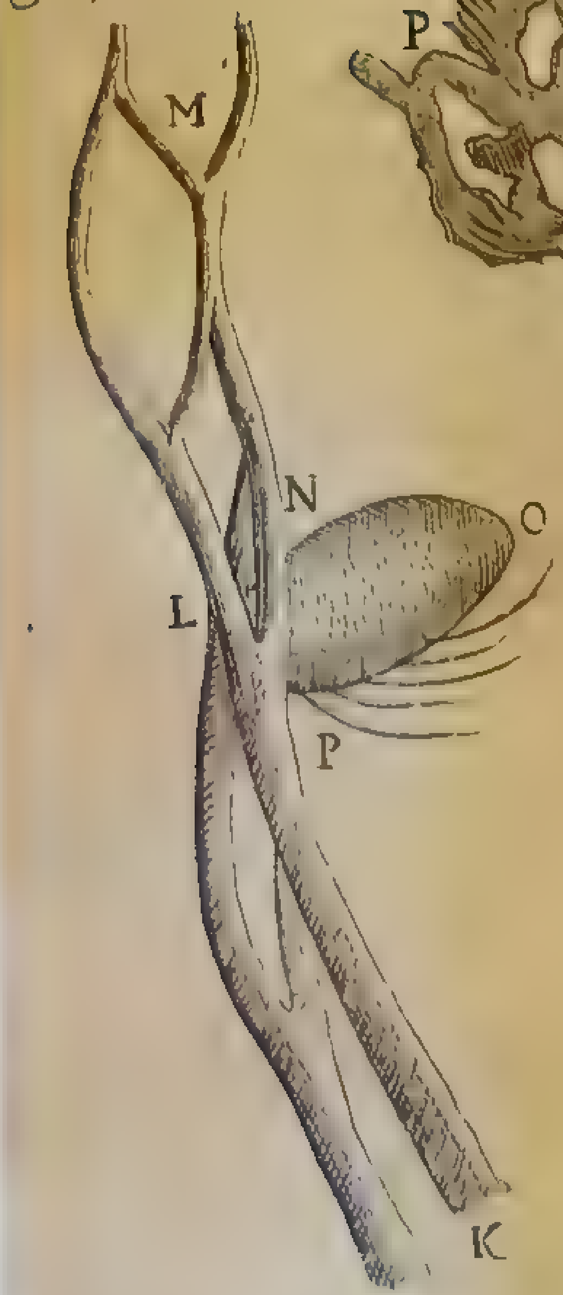

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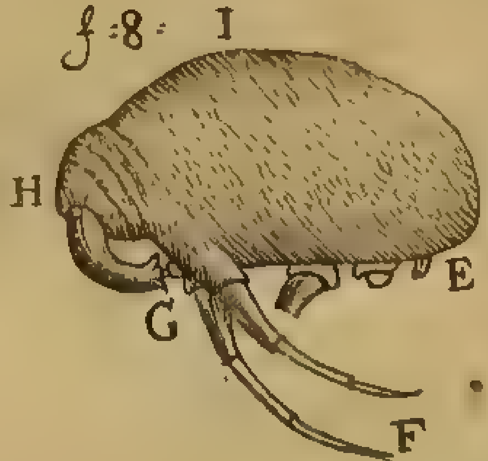

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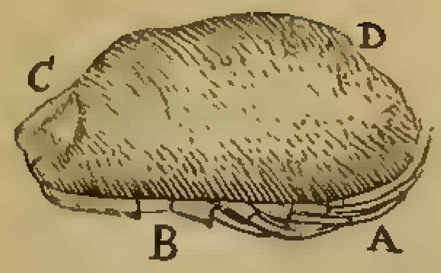

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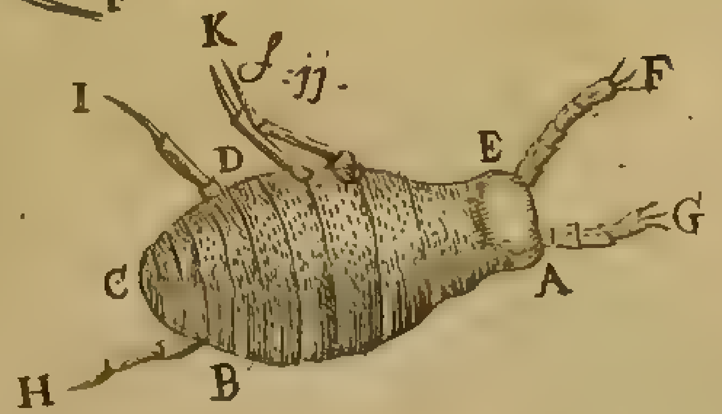

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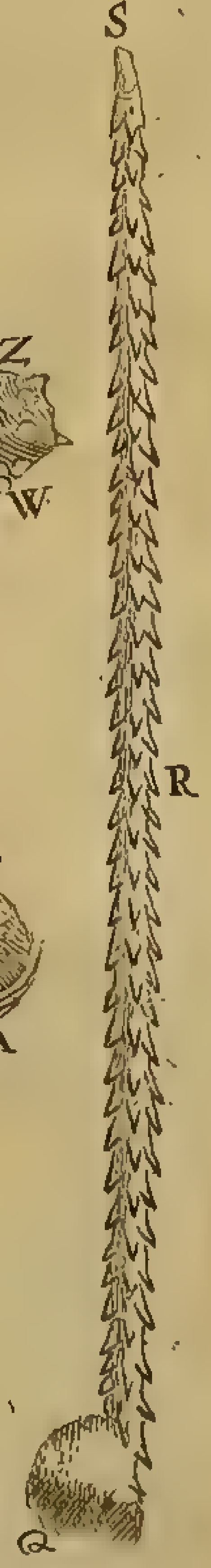

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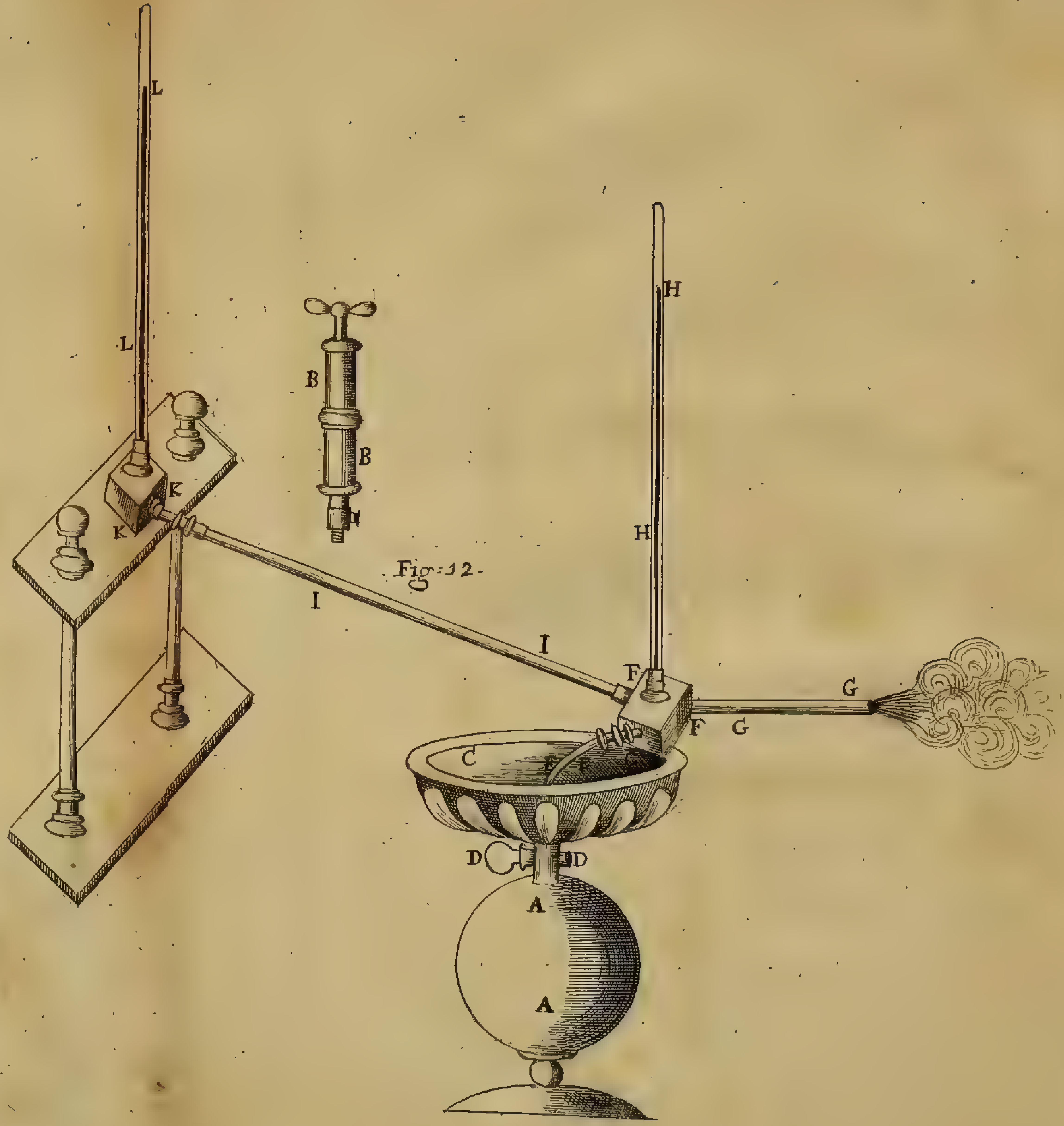

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PHILOSOPHICAL TRANSACTIONS.

For the Months of July *and* Auguſt, 1704.

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I. *A Letter from Mr* Antony Van Leewnenhoek, *F. R. S concerning Cochineel.*

Delft *in* Holland, March 21, 1704.

A Merchant of *Amſterdam* writ me a very obliging Letter of the 7th *ult.* wherein he takes notice, that he has perus'd my obſervations about Cochineel, and entreats me in very civil terms, that I would pleaſe to read his Remarks alſo, (which he has divided into ſeven parts) upon the ſame ſubject: I ſhall not rehearſe them all to you, becauſe it would take me up too much time, but only a few of the moſt conſiderable Points.

The ſaid Gentleman affirms, that it is impoſſible, and altogether incredible, that the Drug call'd Cochineel ſhould be (as I have aſſerted) Flies, or any ſort of Animal endued with Wings, Head or Feet; not only if we conſider the vaſt number of 'em brought in every Fleet from *America*; for you'll find that two of the biggeſt of theſe Particles, eight of the middling ſort, and twenty of the ſmalleſt do hardly weigh a gold Grain, ſo that in a pound of 'em, at a Medium of great and ſmall, one may count 102400 Particles; now in a Fleet that brings 200000 Pounds of this Drug, what an infinite number of Animals muſt there be?

Beſides, ſays he, where can you find Men enough, who at the proper time of the year ſhall catch theſe Inſects, and diſmember every individual by pulling off its Head, Legs and Wings, *&c.* ſo that upon the whole matter he concludes, that Cochineel muſt needs be a Fruit, or the Excreſcence of ſome kind of Plant.

Tho I am clear in my opinion, that Cochineel is nothing elſe but the Trunk or hinder part of a living Creature, and was perſwaded alſo that the Cochineel Animals, like other Inſects, from Worms, are chang'd into Flies; yet to content the above-mentioned Merchant, as well as for my own further ſatisfaction, I have thought fit to renew my Inquiries upon this ſubject; and in ſo doing, I muſt reject ſome of my former Poſitions, being now fully convinc'd, that the Cochineel Animals are not produc'd from Worms, but at once bring forth their own Likeneſſes.

I have therefore, as well as I was able, made an Extract out of the Philoſophical Tranſactions, Numb. 193. pag. 502. for the Months of *March*, *April*, *May* and *June*, where is ſaid as follows.

Obſervations about the making of Cochineel, according to the Account of an old Spaniard *of* Jamaica, *that had lived a great many years in thoſe Parts.*

IT is there ſaid, that there is a certain Plant call'd the Prickle Pear, or *Indian* Fig; the Leaves of which are round and thick, and ſharp pointed; that upon the Leaves or Twigs of the ſaid Plant, are ſmall Knobs or Protuberances, from whence are produced by the Heat of the Sun, little Worms, that theſe Worms in proceſs of time become Flies, in likeneſs to Cow-ladies or Lady-birds, as ſome call 'em, which when they are arriv'd to their full Growth, are thus taken: To Windward of the Plant, on which theſe Animals are found, they kindle a Fire of any combuſtible matter (having firſt ſpread Cloaths under, and round about the ſaid Plant) with the Smoak of which they are preſently ſuffocated; then ſhaking the Tree, they catch them upon thoſe Cloaths in great numbers, and with very little trouble; after which they ſpread them abroad in a like Cloath on a Sandy Place, or a Stone-floor, where they are expos'd to the Heat of the Sun, till they are dry'd that is, till their ſmall Bodies are ſhrivel'd up together, and rubb'd between the Hands, till their Wings, Legs, *&c.* fall off, which are garbl'd out, and then the remaining Trunks of the Animals are put into ſhallow Copper Boxes, till they become quite dry.

The abovesaid Plant has no Flowers or Bloſſoms on it, and the Fruit of it is of a fleſhy ſubſtance and red, and when it is ripe, if you handle it, your Fingers will look as if they were ſtain'd with Mulberries.

Some ſay, that the Cochineel Worms feed upon the Bloſſoms and Fruit of this Plant, which cauſes their Bodies to be of that red colour.

And that if you take the Seed of the Plant, or the dead Worms, and dry them after the above-mentioned manner, that Cochineel is not ſo good as when thoſe Animals have got Wings, and are then ſmother'd.

Now for my further ſatisfaction, I took ſeveral Particles of this ſame Cochineel, as well of the largeſt as of the ſmalleſt, and having diſſected them, I found that they had all Eggs in their Bellies, ſave only one that was exceeding ſmall, and there I could diſcover no Eggs.

When I had open'd ſome of the biggeſt Trunks, and ſeparated the Eggs, which I took out of their Bodies as well as I could from each other, and counted 'em alſo as nicely as I was able, I judg'd that there were above two hundred; and having obſerv'd ſeveral of them with my Microſcopes, I could perceive not only a Membrane or Shell upon the moſt of them, but alſo an Animalculum of an oval Shape included in the ſaid Shell, and almoſt as big as the Shell, that contain'd it; this ſeem'd to me at firſt very ſtrange, and a Phænomenon almoſt incredible in ſo large a Species of Flies, as is the Cochineel.

I ſet my ſelf then, as nicely as I was able, to diſcover the truth of this matter, and I labour'd the Egg-ſhell ſo long, till I was fully ſatisfy'd, that it was really an Animalculum that lay within it.

I purſu'd this my operation with ſo good ſucceſs, that I did not only ſeparate the Egg-ſhell from the Animalculum, but in ſome of them I could perceive their Legs alſo orderly folded up againſt their Body, and could ſeparate them from it, eſpecially in ſuch as were full grown; yea, in ſome of 'em I did even diſcover the ſeveral Joynts of the Legs; and this good fortune I had not only in one, or ten, but in the ſpace of two days, I ſaw the Legs of a hundred Animalcula, many of which, in my handling, were broken off, and lay by themſelves.

One muſt not imagin, that theſe Animalcula have ſuch ſhort Legs as the Caterpillers or Silk-Worms, but the unborn ones have, in proportion to their bigneſs, as long Legs, I believe, as thoſe that are full grown; and as the Legs of thoſe unborn Animalcula ſtand cloſe to the Head, in that part which one may call the Breaſt, ſo when the ſaid Animalculum lay ſtretcht out at length, its little Legs could be juſt ſeen peeping out of the Body.

Thus are they miſtaken, who give the name of Worms to theſe (at firſt) deſpis'd Animalcula, and the reaſon of their Error proceeds from hence, That thro the exceeding ſmallneſs of the object, they are not able to diſcover with their naked Eye, whether the new teem'd Inſect be a Worm, or any other kind of Animal: As for the Eggs of theſe Animals, I think, I need not meaſure them, for they that underſtand Cochineel, may gueſs at their ſize when we aſſert that 200 or more Eggs can lye in ſo ſmall a Particle of matter, as a ſingle grain of Cochineel; to which, if you add the conſideration of the great number of Blood Veſſels lying in ſo narrow a Compaſs, and that each Egg receives its Nouriſhment and Increaſe (as it certainly muſt) by a String or Artery, yea, and that probably there are Veins in every String for the carrying on the Circulation of the Blood, how can we ſufficiently admire the Depth of Almighty Wiſdom, and how unſcrutable are all his Works?

I muſt not omit to acquaint you, that the Shape of the Eggs of the Cochineel-Fly, is very like that of our Hen-Eggs.

When I caſt my Eye upon ſome of theſe Embryos, after I had deveſted them of the Membrane or Shell in which they were ſhut up, I obſerv'd on their Head, a kind of a Tool or Inſtrument, about a fifth part as long as the whole Body of the Animalculum, and at the end thereof a very ſlender point, ſomething like that inſtrument which Nature hath provided thoſe Animalcula with, that are found upon Currant Buſhes, *&c.* and by which they get their Food (according to the Deſcriptions I have given thereof formerly) and when they have ſo done, they clap it to their Breaſts till they have occaſion for it again.

From whence I infer that the Cochineel Flies do alſo acquire their Food after the ſame manner, to wit, that they have no Teeth whereby to gnaw the Leaves of the Plant they dwell on, as Silk-Worms do, but that they only inſinuate their ſaid Inſtrument into the Leaves, and after that manner get their nouriſhment. This notion of mine ſeems to be ſupported by what the old Spaniard ſaid, *viz.* that theſe Animalcula feed on the Bloſſoms and Fruits of the Plant, and that by thoſe means they became red.

From whence we may conclude, that the Inſects don't hurt the Leaves, Fruits, nor even the Bloſſoms of Trees, as far as we can diſcover, which may alſo the better ſatisfy us, that the Cochineel Flies, with the above-mention'd Inſtrument, by boring into the Leaves, acquire both their Food and Increaſe.

I acquainted you before, that I had examin'd ſome of the ſmalleſt Particles of the Cochineel; my only aim was to be ſatisfy'd, (as I ſuppos'd,) that they were the Trunks or Bodies of the Male-Flie; and indeed we ſee, that in all ſmall Flies, that are produced from Worms or Maggots, (at leaſt 'tis my obſervation) the ſmalleſt are always the Males; and this Rule holds good alſo in Flies and Lice, among which alſo, the hinder parts of their Female Bodies are always bigger, by reaſon of their being ſo often impregnated with Eggs; but when I thought I was ſure that the little ones were all Males, and had ſoakt their Trunks thoroughly in Water, in order to ſome further Inquiries, I then imagin'd, that all the Cochineel Flies are Females, and that hardly one fourth Part of 'em was arrived to their full growth, before that their Bodies are fill'd with young; but theſe are only Surmiſes that occurr'd to me at that time.

This Poſition of mine, that all the Cochineel Flies are Females, may ſeem very ſtrange, and perhaps not meet with credit by thoſe that maintain there can be no Animal generated without a Copulation of Male and Female; but they would be of another opinion if they had ſeen the unſpeakable number of Animalcula, which laſt Summer infeſted the Leaves of the Lime-trees, or thoſe other that were found upon Currant Trees, Cherry Trees or Hazel-Nut Trees, all which Animalcula bring forth young alive, and theſe young ones being very little, have their Bodies fill'd with other young, and are all Females, and conſequently there is no Copulation among them: theſe, when they are full grown get Wings, ſo that there is no other Change in them, than increaſing in bulk, and the ſprouting out of Wings.

Now if this be true in theſe above-mentioned Animalcula, altho they are fifty times ſmaller than the Cochineel Flies, we may eaſily believe the ſame of theſe alſo, eſpecially ſince the hinder parts of all of 'em are much alike; in confirmation of which we may add, that Eels, Prawns or Shrimps have alſo no Males among them.

You may remember, the old Spaniard ſaid moreover, that when the Cochineel Flies are dry, they rub them between their Hands, and ſo the Wings, *&c.* are ſeparated from the remaining Trunk; but if he had been more exact in his obſervations, he might have found, that not only the Wings were thus ſeparated from the hinder part of the Body, but alſo the upper part, with which goes alſo the Legs, the Wings and the Head.

And if one obſerves the lower part or Belly of theſe Animalcula, one may perceive that it is divided from the upper, by nothing but a kind of a ſhort ſtring, no thicker than a Hogs Briſtle, ſo that one part may be eaſily ſeparated from the other, eſpecially when the Animalcula are dryed: Now this upper and lower part of the Body are plac'd ſo near each other, that they will eaſily appear to the naked Eye to have been always united.

Furthermore the old Spaniard affirms, that the Cochineel is not ſo good till the Animalcula have got Wings; from whence we might be apt to conclude, that the Cochineel Animalcula do become Flying Creatures all together, juſt as it happens to Silk Worms, which from Reptiles, are all changed, and that in a very ſhort time, into Butterflies.

But the Caſe is quite otherwiſe with theſe Cochineel Flies; (at leaſt as far as it appears to us) for they dont lay their Eggs all together, or in one day; but I rather ſuppoſe, that one of theſe Animalcula at one time brings forth twenty Eggs or young ones, and ſo they require above ten days before they can be deliver'd of all their Eggs, for after I had taken 200 Eggs out of ſome of the Cochineel Flies, I ſaw exceeding ſmall ones ſtill remaining in the Ovarium or Egg-neſt

In my obſervations upon the Lime trees, I ſaw not only ſeveral Animalcula that had Wings, but divers others much ſmaller, and that in a gradual Deſcent, ſo far that many of 'em were hatcht that very day; and theſe obſervations I did not make at one certain ſeaſon of the year, but found that they continued to hatch, as long as the days were moderately warm.

And ſo I reckon it is with that Animalculum likewiſe, whoſe Trunk or lower parts compoſe what we call Cochineel; at leaſt it was my opinion, after I had ſufficiently obſerv'd ſeveral Grains of Cochineel given me by three different perſons; for when I oppos'd ſome of the largeſt grains of Cochineel againſt the ſmalleſt, ſo far as I was able to diſtinguiſh by my Glaſſes, I found that 15 of the ſmall ones were hardly equal to one of the great; and when I viewed the Powder or Duſt of the Cochineel, which I took out of the bottom of a Box, I met with ſome Trunks of thoſe Flies ſo very ſmall, that I judg'd 100 of them unequal to one large Grain.

Since there is not one man in a thouſand, that has any knowledge of Cochineel, nor of the ſize of its Grains, I have thought fit to cauſe one of them to be deſign'd by my Limner, ſee Fig. 1. A B.

I took another Grain of Cochineel, and placed it before a Microſcope, and caus'd it to be drawn juſt as it appeared to the Limner, as you may ſee in Fig. 2. CDEFG. the extream Parts being deſcrib'd by C, and by EF, a ſeeming Orifice, which is the Part where the String was broken off, and by which both parts of the Body were joyn'd together.

The Concave Bows or Circles that appear in the Cochineel grain DEFG, are not natural but adventitious to the ſaid Grain, and proceeds only from the drying or ſhrinking up of the great number of Eggs that lye within the Animalculum; for if the ſaid Grain were well ſoakt and plumpt up with Water, thoſe concave parts would become convex, and be alſo more obvious to ſight as well as the Stem of that String we juſt now mention'd.

But if you take one of the largeſt Grains, and which is ſomewhat flat, that part of the Trunk will not ſhrink inwards, the reaſon whereof I imagin to be, That the Animalculum, before it was kill'd, had diſcharg'd moſt of its Eggs.

I cauſed ſome of theſe Cochineel grains to be ſteept in Rain-Water about 24 hours, and then open'd 'em in the preſence of the Limner, the reaſon of which was, that when the Eggs and the young ones in 'em were dry, they were ſo ſhrivel'd, as I took 'em out, that it was impoſſible for him to diſcover or repreſent their Figure.

Fig. 3. H I K. ſhews you an Egg with its Shell or Membrane, as it was taken out of a grain of Cochineel, in which Egg one might ſee the young one within, and the Shell ſurrounding it.

This Egg was drawn by the ſame Microſcope, as Fig. 2. and when we lookt upon it ſo long till the Egg became dry, the Shell or Membrane would become ſo ſhrivel'd, that we could no longer have a diſtinct view of it.

Fig. 4. L M N. repreſents an unborn Cochineel Animalculum, which I had ſeparated from the Egg-ſhell with a great deal of pains; the Animalculum lay with its Back to my ſight, and in ſuch a poſture as to ſhow three of its Legs.

By Fig. 5. O P Q R S. is ſhown a ſmall Particle of the Veſſels belonging to an Ovarium or Egg-Neſt, where one may ſee divers broken Filaments or Strings, to which Strings the Eggs were faſtned, except the great Veſſel deſcribed by R. and through which I may imagin, ſeveral other Veſſels received their matter for the Nouriſhment and Increaſe of their Eggs.

ST

S T. Shows a String to which the Egg T V was faſtned, as other Eggs were to the other Strings before I broke 'em off.

Theſe Strings O P Q R S. were almoſt tranſparent, and I could ſee other ſmall Particles in 'em, when I took them out of the Cochineel grain, and ſeparated the Eggs from them; but as they begun to dry, they aſſumed a reddiſh Hew; and when they were quite dry, they became of a light red Colour.

Fig. 6. W X Y Z. repreſents another Animalculum, which I alſo took out of its Egg-ſhell, and gave it preſently to the Limner to draw; in it are the Legs to be ſeen very plainly between W and X, but I could not ſee that Leg which lies upon the Body.

Fig. 7. A B C D. is another Animalculum clear'd of the Egg-ſhell, in which you may alſo perceive the Legs between A and B.

Fig. 8. E F G H I. deſcribes an Animalculum lying upon a Glaſs, as I had taken it two days before out of a Cochineel grain; it was not much alter'd by growing dry; it had but two Legs left, the other being broken off.

In this Animalculum appear'd, at the extremity of the Head, that crooked part deſcribed by G H. which I ſuppoſe to be the Inſtrument wherewith it gets its Nouriſhment out of the Leaves of the above mention'd Plant.

After this I took another Animalculum with ſome of the Blood-Veſſels, out of the Belly of its Dam, which ſaid Animalculum was alſo partly cover'd with the ſaid Blood-Veſſels, and placed it before my Glaſs.

Fig. 9. K L M. repreſents a ſmall part of the Blood-Veſſels, and N O P. the Animalculum with its ſix Legs, as far as it could be ſeen.

Moreover, I ſaw among the Eggs that I had ſeparated from the Ovarium, (as alſo faſtned to the Veſſels of the

Ovarium) ſo exceeding ſmall Eggs, that a hundred of 'em were not equal in bigneſs to one great Egg, and charged my Limner to make a Draught of ſome of thoſe Eggs when he was viewing the Ovarium, but he neglected to do it.

In all the Cochineel grains that ever I examin'd, I found Eggs in their Bellies, and young ones in thoſe Eggs, but in ſome of 'em many more than in others; and in thoſe whoſe Bellies are mightily ſhrivel'd, I found but few Eggs; from whence I concluded that ſuch as had but few Eggs in 'em, had already brought forth a great many young, and would not have lived long, according to the Age of all ſmall Flies that die ſoon after laying their Eggs.

Now, foraſmuch as thoſe Animalcula that are found upon Lime-trees, *&c.* have young ones in their Bellies, even before they come to half their growth, my buſineſs was to ſee whether it be ſo alſo with the Cochineel Flies, wherefore I took eight of the ſmall ones, which I judg'd did not altogether make more than one large grain, ſuch as is deſcribed Fig. 1. by A B. and ſteept them over night in Rain-Water, and next morning I found but five that had ſubſided, the other three being ſo light as to ſwim upon the Water which conſequently had not penetrated into them.

Out of the firſt of theſe ſmall grains that I diſſected, I took eleven Eggs, in ſome of which the Animalcula were ſo compleatly form'd, that I could eaſily ſee their Legs, beſides ſeveral exceeding ſmall Eggs.

In the ſecond I could meet with no Eggs that were come to their full growth.

Out of the third I took three perfect Eggs.

In the fourth there were none perfect.

In the fifth two perfect Eggs, but always leſs.

From theſe Obſervations I conclude, that the Production of the Cochineel Flies happens after the ſame manner as that of the Animalcula upon the Lime, Currant, Plumb and Hazel-nut Trees.

As for what the old *Spaniard* ſaid farther, that they ſtifle the Cochineel Flies with Smoak as ſoon as they have got Wings, becauſe then the Cochineel is better; this is not ſtrange at all, becauſe when the ſaid Flies are arrived to their full growth, their Bodies are at that time moſt full of Eggs; from whence in my opinion is chiefly derived that noble colour of Scarlet, notwithſtanding which, I muſt needs affirm, that moſt of theſe Cochineel Flies (as far as I could obſerve) are kill'd or ſmother'd before they come to their full growth.

Methinks it is odd, that the *Spaniard* ſhould not tell us whether they gather the Cochineel once or twice a year, the rather becauſe the Iſlands of *Cuba*, *Hiſpaniola* and *Jamaica*, from whence it moſtly comes, in compariſon of our Countries, have little or no Winter; for thoſe Iſlands lying between 18 and 23 degrees of N. Lat. the Sun, in their Winter is 40 degrees above the Horizon, whereas with us at the ſame time it is but 14 degrees and a half above the Horizon.

If we had as much Summer as the aforeſaid Iſlands, the Animalcula which we call a ſort of Louſe, would ſo greatly endamage the Currant Trees with their Filth, that there would be no eating of the Fruit, and yet, according to all appearance, the Cochineel Flies are more Prolifick than the Animalcula upon the Currant Trees.

The Cochineel Flies, in all appearance, do dwell upon the back or underſide of the Leaves, which defend them from the great heat of the Sun in thoſe parts; and as the Smoak can't deſtroy all thoſe Flies, the few that remain do multiply very much in a ſhort time.

I had got about a Spoonful of Powder or Duſt, together with ſome Sands out of the Cochineel Box, and found that that which appear'd to be nothing but Duſt, was abundance of very ſmall Cochineel Flies, and ſome of 'em ſo little as if they had been juſt hatch'd, and ſome of 'em gradually bigger than others; there were alſo other ſmall Particles which I judg'd to be the Excrements of the Animalcula; I ſaw alſo abundance of Legs with three Joynts, and ſome alſo that had but two Joynts, and a few one Joynt only; among theſe Legs, ſome had Claws on, which were either white, or dark colour'd, or of a light red.

I ſaw moreover, ſome Particles that I could not bring home with me, which I judg'd to be the Heads of theſe Animalcula, and other Particles likewiſe of a beautiful red colour, that I fancy'd to be the upper parts of the Body; in the ſaid Duſt there were alſo ſome few pointed Inſtruments, or rather Prickles, that were no thicker than a ſingle hair of ones Head, among which there were two or three that were four times as thick as the reſt; and theſe, I preſume, were the ſharp Prickles, wherewith (as the *Spaniard* tells us) the Leaves were armed, becauſe ſome of them were of a bright, others of a darker yellow.

Foraſmuch as the ſaid Prickles are guarded with an infinite number of Teeth like Saws, I have thought fit to take a draught of ſuch a wonderful Product of Nature.

Fig. 10. Q R S. repreſents the ſaid Prickle with abundance of Teeth about it, and no thicker than the Hair of my Head.

I was not able to diſcover the Legs of thoſe Animalcula, which I told you I took out of the aforemention'd Eggs, unleſs I had put them out of that exact Order in which they lay, neither could I ſee them in their natural diſpoſition, tho I took a great deal of pains to do it; the reaſon of which is, that the Animalcula, whilſt they were in the Egg, were of a dark red colour, and not at all tranſparent, eſpecially ſuch as were almoſt come to their full growth; at laſt, but with great difficulty, I could perceive, of ſome Animalcula that were in the Egg, ſix

Legs, diſpos'd in ſuch exact order, as you may have obſerv'd in the Aurelia of a Silk-Worm. At the ſame time I diſcover'd that the unborn Animalcula had two Horns, in which, at one time, I counted five Joynts, and another time I thought I ſaw more.

After theſe obſervations of mine, to wit, that the Cochineel Animalcula are not chang'd from Worms to Flies, I reject my former Poſitions, conſiſting herein, that the Cochineel Flies have no Shields wherewith they cover their Wings, having found among the Cochineel Grains, little Shields or *Vaginæ* that were black with a ſmall round red ſpot upon each Shield, whereupon I and others judg'd, that theſe were the Shields of the Cochineel Flies.

The Animalcula, whoſe Wings are cover'd with Shields, are all of 'em, as far as I know, produc'd either in the Earth or in Wood, from whence they receive their Nouriſhment and Growth; and if Nature had not made this Proviſion for them, being ſhut up in the Earth or Wood after that they are chang'd into flying Creatures, they could not dig out their way without hurting their tender Wings.

For having found amongſt the Cochineel grain, one of the aforeſaid Shields upon the hinder part of an Animalculum, and viewed the ſame more narrowly, I ſaw plainly, that that Trunk or hinder part had no Similitude with any of the other Cochineel grains.

Now ſeeing that all Creatures from the beginning are made to bring forth their like, if the Cochineel Flies had been endow'd with Wings, it would have been in vain for the reaſons above-mention'd, indeed it is neceſſary they ſhould have Wings as ſoon as they are full grown.

I ſent my *Amſterdam* Friend a Duplicat of what I have here related to you at length, as well as a Copy of the incloſed Figures, who has return'd me a long Letter in anſwer thereto, wherein he ſays, that he has alſo taken 200 Particles out of a large Cochineel Grain, but that he could not after the niceſt obſervations, diſcover any Animalcula in the Eggs, *&c.* wherefore he finally concludes, that what I call Blood-Veſſels are analagous to the ſame parts which we find in Cherries, Grapes, *&c.* and that what I take for the Shell or Membrane of the Egg, are only the Skins that cover the Seed.

Now, tho I was entirely ſatisfy'd, as to my own particular, in the account I have given, and Draughts I have caus'd to be taken of the Cochineel grain, yet I diſſected ſeveral others of the largeſt ſort, and took the Animalcula out of the Egg-ſhell, and placed them before divers glaſſes in ſuch order, that I could not only diſtinctly ſee the body of the Animalculum, with its parts divided into ſeveral Circles, but the two Horns alſo, with the Joynts wherewith Nature has provided all theſe unborn Animalcula, were as plainly viſible; and the next day I caus'd the Limner to take a draught of ſuch an Animalculum, juſt as it appear'd to his Eye, without adding or diminiſhing any thing from it, which is my manner at all times.

Fig. 11. A B C D E. ſhows the Body of the ſaid Animalculum, B H. D I. and D K the 4 Legs, the 2 other being hid from the ſight: E F repreſents one of the Horns, of which we had a very fair view, the ſecond Horn A G. was not placed in ſo convenient a light, and conſequently not ſo well delineated; at the end of the Horns were three ſmall Hairs, which are alſo deſcribed by F. and G.

Thus I have given you my obſervations, conceptions and concluſions about the Cochineel Grains or Animalcula; and if any body elſe ſhall make any farther Remarks upon this ſubject, and thinks that I am miſtaken in any of my Diſcoveries or Inferences from them, I ſhall be obliged to 'em, if they will let me know it, and ſhall freely ſubmit to the opinion of ſuch as ſhall make any better Experiments upon this buſineſs of Cochineel.

II. *An*

II. *An Experiment, to ſhow the cauſe of the deſcent of the Mercury in the Barometer in a Storm.* *By Mr* Francis Hauksbee.

IN the late Violent Storm or Hurricane of Wind, it was obſervable that the *Mercury* in the Barometer did not only conſiderably ſubſide, but upon Extraordinary Guſts a Viſible Vibration of the Quickſilver appear'd. And for ſatisfaction of the Curious, That High Winds are capable to leſſen the Preſſure of the Atmoſphere, an Experiment has lately been Devis'd, and made at a meeting of the Royal Society at *Greſham-Colledge*, *April* the 12th, 1704. by Mr *Fra. Hauksbee*, giving a Demonſtration of this Phenomenon. A Deſcription of which take from the Delineation, Fig. 12. The Recipient .A. containing about 5 quarts, having about 3 or 4 times its Natural quantity of Air compreſt in it by the Syphon, B. B. Which for that purpoſe is ſcrew'd on at the Bottom within the ſide of the Baſon C. The Stop-cock .D. being turn'd, and the Syphon taken off, a ſmall Swan-neck Pipe .E. is ſcrew'd on in its place. The noſe of which fits into a Braſs Socket, which is fixt in a Cubical piece of Wood .F. right againſt the Horizontal pipe .G. From the ſame Cubical piece .F. ariſes a Naked Barometer .H. H. whoſe Ciſtern lyes open to the paſſage which leads from the Swan-neck Pipe to the Horizontal Tube aforeſaid. Likewiſe from the ſame Piece .F. proceeds another Pipe or Tube parallel to the Horizon diſtinguiſh'd by .I. leading to another Cubical Piece of Wood .K. 3 foot diſtant from the former: Out of which likewiſe ariſeth another Barometer .L. L. whoſe Ciſtern is alſo open to the Horizontal Tube .I. and by that means hath Communication with the open Ciſtern of the other. The Parts thus diſpos'd, and the Stop-cock being turn'd, the Condens'd Air proceeds ſtrongly thro the Swan-neck Pipe, which diſcharges it into the Horizontal Tube .G. Whoſe Currency ſo leſſens the Preſſure of the Atmoſphere upon the Ciſterns of the reſpective Barometers as to cauſe the Mercury to deſcend 2 inches at leaſt. And 'tis obſervable, That that Barometer which is 3 foot diſtant from the Current Air is equally affected, and ſubſides parallel with the other. Likewiſe it is to be noted, that as the Current Air is weakned in its force, ſo doth the Weight of the Atmoſphere again Encreaſe, and the Mercury in the Barometers gradually Aſcend.

III. *An Account of ſome Eclipſes of the Sun and Moon, obſerved by Mr* Tho. Brattle, *at* Cambridge, *about four miles from* Boſton *in* New-England, *whence the Difference of Longitude between* Cambridge *and* London *is determin'd, from an Obſervation made of one of them at* London. *By* J. Hodgſon.

ON the 12th of *June* 1694. in the morning I went to the Colledge at *Cambridge*, about 4 miles from *Boſton*, and obſerved, with the Braſs Quadrant there, with Telleſcopick Sights, the Rays of the Sun being tranſmitted through one of the ſaid Sights, on a clean Paper, paſted on a plain piece of Board, and faſtned at right angles at about a foot diſtance from the ſaid Sight, on which Paper I had drawn a Circle between 2 and 3 Inches Diameter equal to the Suns disk, and within that ſeveral Concentrick Circles dividing the Diameter into 24 equal parts,whereby I could obſerve to ½ a digit,the room in which the Obſervation was made was darkened with Blankets, and in order to render the Obſervation the more Exact (Mr *Henry Newman* aſſiſting me all the while) I took the Altitude of the Sun with the aforeſaid Quadrant, as followeth.

Obſervations made of the Suns Altitude before the Eclipſe began, in order to rectifie the Watch.

	By the Watch				Comp. Altit.		Time by Calcul.			differ.	
	h	′	″								
	8	26	37		49	31	8	16	40	9	57
at		31	27	Mane	48	26		21	40	9	47
		38	26		47	20		28	32	9	54

The Eclipſe was firſt perceiv'd at 9 h 25 ′ by the Watch, at which time the Sun had ſcarcely been eclips'd 1 minute, ſo that

	By the Watch		True time		
	h	′	h	′	
	9	24	9	14	It began
	9	32	9	22	about 1 digit eclipſed
	9	48	9	38	full 3 digits
	9	57¾	9	48	about 4
	10	06	9	56	near 5
	10	15	10	05	full 6
	10	33	10	23	about 8
At	10	43	10	33	full 9
	10	47	10	37	full 9½
	10	53	10	43	full 10
	10	59	10	49	about 10½
	11	03	10	53	better than 10½
	11	06	10	56	much the ſame
	11	09	10	59	rather decreaſing

By

	By the Watch		True time	
At	11 10½		11 00½	ſenſibly decreaſed near ¾ of a digit
	11 14½		11 04½	neareſt to 10 digits
	11 25		11 15	full 9 digits, *i. e.* full 3 3 digits reſtor'd, or the Shadow rather within 9 digits
	11 29		11 19	8½ compleat
	11 34½		11 24½	full 8 digits
	11 44		11 34	full 7
	11 48		11 38	full 6½ digits
	11 52½		11 42½	juſt 6
	0 02½	P. M.	11 52½	juſt 5
	0 13		0 03	P.M. full 4
	0 26		0 16	full 2½
	0 32		0 22	better than 2
	0 41		0 31	better than 1
	0 48		0 38	ended.

Obſervations made after the Eclipſe was done, of the Sun's Altitude, in order to rectifie the Watch.

	Time by the Watch h ' "		Comp. Altit.	True time.	differ.
At	3 31 30		45 52	3 21 36	9 54
	36 15		46 23	26 16	9 59
	38 10	P. M.	46 45	28 16	9 54
	46 50		48 19	36 48	10 02
	48 10		48 30	38 20	9 50

Hence it appears, that the Watch went about 10 minutes too faſt during the whole Eclipſe, as we have all the way allowed.

So that the Eclipſe

	h	′
Began at	9	14 Mane.
Ended at	0	38 P. M.
Laſting in all	3	24.

Note, that in the Calculation, the Latitude of *Boſton* was allowed to be 42 . 2′5.

The ſecond is of a Lunar Eclipſe, that happen'd *Feb.* the 11th, 1700, in the evening, as follows.

The Moon roſe eclipſed, and the Horizon was ſo overcaſt, that I diſpair'd of having any obſervation; but at ½ an hour paſt 6 ſhe came from under the Cloud, and at 6 h 25′ I had juſt a ſight of her, and judge her eclips'd about 5 digits, at

h	′	
6	29	The Section equidiſtant from M. Ætna & Horminius.
	32	Palus Maræotis begins to be ſeen.
	34½	Palus Maræotis and Mons Apollonius ½ out.
	37½	Palus Maræotis quite free, and Palus Maræotis and Palus Mæotis in the perpendicular.
	42¾	The Shadow near an Inch from Palus Maræotis, Mons Horminius and Mons Hercules.
	46¼	Palus Maræotis in the Nadir, and that part of Palus Mæotis to my right hand in the Prime Vertical.
	57	The upper part of the Section is now, and has been for a long time in Inſula Major in Mare Caſpio (and the Section now perpendicular) and the lower part wheeling about from Palus Maræotis.
7	20	Mount Sinai firſt appears at 22′ wholly free.
	25½	Palus Maræotis and Mons Horminius near perpendicular.
	43	The Eclipſe over in the Teleſcope, and at 49 to to the naked Eye.

My Clock was ſet by my Ring-Dial about 9 a Clock in the morning, as exactly as I could judge, and the obſervation was made with my 4½ foot Teleſcope, with all four Glaſſes in it.

The Obſervation of the Eclipſe of the Sun on the 27th of *November* 1703, was as follows.

At half an hour paſt 8 in the morning, I ſet my Clock exactly by my Ring-Dial, and at half an hour paſt 9 they nicely agreed, at

h ′
10 00 The Sun was not touch'd.
06 The Moon enter'd on the S S W Point as near as I could judge.
15 The Eclipſe was conſiderably advanc'd.
20 ſeem'd to be about half a digit eclipſed, rather more than leſs, and the Section to be a ſmall matter more Weſtwardly.
10 25 Much the ſame, and near the ſame point.
30 ſeem'd to be leſs.
33½ The middle of the Section nearer the S W, and the Diameter of the Section leſs every way.
37½ Much leſs and nearer the Weſt.
44½ It ended, and was juſt over, going off near the S W, ſo that all the while it was within a point or two of the place where it firſt came on, or between the S S W and the S W.

I judg'd when it was at the height, that the Chord of the eclipſed part was neareſt equal to the ſide of an inſcrib'd Decagon, or ſubtended about $\frac{1}{10}$ of the Periphery of the Sun's Disk.

I obſerv'd this Eclipſe with a Teleſcope of one joynt, 4 foot and a half in length, and had only 2 Glaſſes, ſo that it inverted the object; and I had a red Glaſs which ſuited it, ſo that I could ſcrew it in juſt before the Eye-Glaſs, and was not fain to hold it in my hand, as when I ob-

I obſerv'd the Sun's Altitude with the braſs Quadrant, which was a great convenience.

The laſt is an Obſervation of the Eclipſe of the Moon on *December* the 12,1703 in the morning.
Time by the Clock.

h ′

11 45 That part of the Moon's Disk near Alabaſtrinus, looks ſomewhat duskiſh, and the Eclipſe beginning to enter between Palus Maræotis and M. Porphyritis.

11 53 The true Shadow was well entred.

58 M. Porphyritis juſt cover'd.

12 03 ½ near 3 digits darkened.

7½ Mount Ætna begins.

9½ quite covered.

14½ Lacus Niger major and M. Sinai almoſt equidiſtant from the Section of the Shadow, Lacus Niger Major, being ſomewhat the nearer of the two.

18 ¼ Lacus Niger Major begins 19½ quite covered.

21 ¾ Mount Sinai begins.

21 ¾ Quite covered and the Moon about 6 digits eclipſed.

12 24½ Besbicus begins.

26 Quite covered.

28¾ Byſantium begins.

29½ Covered and Mount Horminius begins.

32 Apollonia begins.

33 Covered.

37 The Shadow equidiſtant from M. Corax and Mount Paropamiſus, or ſomewhat nearer to Mr Corax.

39 ½ between 9 and 10 digits eclipſed.

43 M. Corax begins.

h '
12 44 ¾ Palus Mæotis begins, and at 45 ¾ the inner of M. Paropamiſus begins.
50 Palus Mæotis quite covered.
51 ½ The Moon not quite eclipſed.
52 Nor yet.
53 Nor yet.
54 Scarce.
54 ½ Quite Immerg'd and the Mora begins.
14 39 Preciſely, ſhe Emerg'd between Palus Maræotis and Mons Porphyritis.
42 Palus Maræotis begins.
43 Quite clear.
47 M. Porphyritis quite clear.
55 About 3 digits reſtor'd.
59 Mount Ætna begins.
15 02 That and Lacus Niger Major at the ſame time clear.
8 ½ Mount Sinai about half free.
9 ½ Quite free, and about 6 digits reſtored.
15 Besbicus free.
19 ¼ Byſantium free.
29 ½ About 9 digits ſeem'd to be reſtor'd.
30 ¼ Mons Herculis free.
32 ¾ Palus Mæotis begins.
38 ½ Quite free.
41 ½ Inſula Major in Mare Caſpio free, and in the middle of the Section.
42 ½ Not yet wholly clear.
45 Fully over in the Teleſcope, tho a kind of a Smoak remained ſome little after to the naked Eye.

In order to the adjuſting of the time, I ſet my Clock with the greateſt exactneſs I could the morning preceding, both from my Ring Dial and the riſing of the Sun, which I very narrowly watch'd and obſerved, and found it to agree with the Sun's ſetting the following evening; ſo that it went all the time the Eclipſe was, very ſteadily and regularly; but for the greater Certainty and Satiſfaction, I took the Altitudes of the following Stars with the Braſs Quadrant with Teleſcope Sights out of my Chamber Window, the lowneſs whereof would not permit me to take them, when they were at all higher elevated.

⁎ in dextro humero Orionis.

By the Watch			Comp. Alt.					Differ.	
	h	'			h	'	"	'	"
	6	15	78	18	6	13	40	1	20
	6	21½	77	03	6	20	28	1	02
		26¼	76	11	6	25	08	1	07
Procyon									
	8	9¼	77	20	8	08	04	1	11
		14½	76	20	8	13	32	0	58
		21	75	13	8	19	36	1	24
Re-	10	8½	77	46	10	07	18	1	12
gulus		17¼	76	11	10	15	58	1	17

So that my Clock went by theſe Obſervations neareſt 1' too faſt.

This is all the account that can be given at preſent, by

Sir,

Your Humble Servant,

T. B.

I had the good fortune (by the aſſiſtance of ſome ingenious Friends in *Finch-Lane*, near the *Exchange*) to make ſome few obſervations of the laſt of *December* the 11th, 1704 (of which I gave an account to this Honourable Society ſome time ſince) as follows.

The Heavens being cloudy moſt part of the night, it was 35' after 4 in the morning following, before I could perceive that the Moon was eclipſed, and then as near as I could judge, ſhe had been ſo about 3 or 4 minutes at moſt, from whence we may conclude it began at *London* about 31 or 32 minutes after 4 the ſame morning.

Mr *Brattle* found, that at 44 minutes after 11 at Night, part of the Moon's Disk look'd ſomewhat duskiſh, and that at 52 minutes, the Shadow was well entred, *ſo that from hence, as well as from a Compariſon of the Ingreſs and Egreſs of the principol Spots, it probably began there about 49 minutes after* 11, *whence it follows, that* Cambridge *in* New England *lies* 4^{h} 4′2½, *or* 70 37′ *to the Weſtward of the Meridian of* London.

I happen'd to ſee the Moon the ſame morning at 35 minutes after 5, when ſhe wanted at moſt but 3 minutes of being totally eclipſed; ſo that at *London* ſhe immerg'd at 38 minutes paſt 5.

Mr *Brattle* ſaw her immerge exactly at 54 minutes after 12, whence it follows, that the difference of the Meridians found by comparing theſe obſervations, is 4 h 43′½, or 70° 52′ agreeing very well with the former; ſo that by taking a mean between them, the difference of Longitude of the 2 Places is 4 h 43′, or 70° 45′.

I ſaw no more of the Eclipſe that morning, and ſhould be very glad to meet with ſome other obſervations to confirm theſe, but their mutual agreement gives great reaſon to believe that the Deductions are good, and may be rely'd upon.

IV. Ob-

V. *Obſervations of the Weather, made in a Voyage to* China. Ann. Dom. 1700. *by Mr* James Cunningham, *F. R. S.*

ay of the onth.	Therm. Altitud. below extream H.	Philoſ. Barom. Altitud	Latitude N. or S.	Longitud Eaſt from St Jago.	Needles Variation Eaſt or Weſt.	Needles Inclin. or Depreſſion of the N or S point under the Horizon.	Winds.	Weather.
Ja. 31.	5 Divi.		1° 26' N	6° 16' E		8° 30' N	Variable Breezes, and 10 Hours calm	Rainy and Cloudy
br. 1	4		1 18 N	6 11 E			N S by W S W by S and 16 hours Calm.	Rainy and cloudy with Lightning
2	5		1 14 N	6 13 E			Variable Breezes, and 11 Hours calm	Fair
3	5		1 07 N	5 57 E			Variable	Fair with Rain at noon
4	2		0 27 N	5 49 E			Variable	Fair and cloudy, Rain in the forenoon
5	4		0 00	5 44 E			Variable with 9 hours calm	Rainy and cloudy
6	4		0 30 S	5 35 E			Variable with 4 hours calm	Fair and cloudy with ſome Rain
7	5		1 46 S	5 08 E		3 30 S	Small Gales from E by S to S E by S	Fair and cloudy
8	4 ½		3 00 S	4 56 E			Eaſie Gales from E by S to S E by E	Fair and pleaſant
9	5		4 29 S	4 19 E			Eaſie at E S E, and S E by E	Fair and pleaſant
10	5		5 57 S	3 54 E		10 00 S	Eaſie at S E by E and S E	Fair and pleaſant
11	6		7 10 S	3 05 E	2° 17' E		Fine Gales S E by E	Fair and pleaſant
12	6		8 46 S	2 22 E	2 20 E		E S E fine	Fair and pleaſant
13	8		10 29 S	1 37 E	2 50 E		E S E and E by S	Fair and pleaſant with one Shower
14	7		12 05 S	1 20 E	3 30 E		E by S and E	Fair and cloudy with ſome Squales
15	7 ½		13 44 S	1 10 E	4 12 E		E by N to E S E	Fair with one Squale
16	7 ½		15 09 S	1 10 E	4 10 E	19 00 S	E by S and E	Fair and pleaſant
17	8		16 32 S	1 14 E	4 52 E		E	Fair and pleaſant
18	8 ½		18 01 S	1 19 E	5 14 E		E	Fair and cloudy with one Shower
19	7 ½		19 14 S	1 29 E	5 42 E	30 00 S	E by S to E by N	Fair with one Shower
20	8		20 05 S	1 15 E	6 18 E		SE by E to E by N ſmall	Fair and cloudy with ſeveral Squales
21	7		21 16 S	1 35 E			N N E to E by N eaſi	Fair with 2 Showers

Weather.

Weather.	Winds.	Needles Inclin. or Depreſſi. of the N or S point under the Horizon.	Needles Variation Eaſt or Weſt.	Longitud. Eaſt from St Jago.	Latitude N. or S.	Philoſ. Barom. Altitud.	Therm. Altitud. below extream Heat.	Day of the Month.
Fair with 1 Shower	N N E to E by N		7 02 E	1 54 E	22 23 S		7	22
Fair and pleaſant	N N E to N N W			2 39 E	23 47 S		5	23
Fair and pleaſant	N N E to N E by E			3 28 E	25 21 S		5	24
Fair and pleaſant	N E by N to N N E	39 00 S	8 00 E	4 09 E	26 38 S		6½	25
Fair and pleaſant	N E by E to N			4 52 E	27 49 S		6½	26
Fair ſometimes cloudy	N to N W			6 07 E	29 16 S		8	27
Cloudy & ſqually with Rain and Lightning	W N W to W S W			7 34 E	30 01 S		8	28
Squally with much Rain & ſome Thunder.	W N W to N by E freſh			10 20 E	31 26 S		10½	29
Uncertain with Thunder and Rain	N W to W moderate			11 49 E	31 10 S	8	12½	March 1.
Fair and cloudy	W to N W moderate	42 00 S	4 50 E	13 57 E	31 16 S	10	13	2
Cloudy and ſqually	W to S freſh			16 04 E	31 13 S	14	17½	3
Squally and cloudy	S by E to S E by E			17 51 E	30 26 S	18	23½	4
Fair and cloudy	E S E and E by S			17 17 E	30 58 S	19½	26	5
Fair and cloudy	E by S to E by N moderate		3 05 E	17 08 E	32 07 S	20	24	6
Fair and cloudy	E by N to S E by E ſmall			16 54 E	33 06 S	26	23	7
Fair and cloudy	S E to S S W moderate		2 05 E	18 26 E	[illegible] 14 S	32	32	8
Cloſe and ſqually	S to S S W blowing hard			19 59 E	32 43 S	38½	33	9
Gray and cloudy	S by E and S moderate			21 13 E	32 27 S	34	29	10
Squally, cloſe and cloudy	S by E to S E by E			22 32 E	32 01 S	32½	29	11
Dry, cloſe and cloudy	S S E to E by S			22 23 E	32 36 S	33½	28½	12
Fair and cloſe	E by S to E by N eaſie			22 42 E	33 42 S	34	27	13
Fair and cloſe	Variable and ſmall		1 15 E	23 23 E	34 08 S	31	26	14
Fair and ſerene	N to N W by N eaſie		0 57 E	25 26 E	34 19 S	30	26	15
Fair and ſerene, ſometimes cloſe	N by W to N N E		0 20 E	27 45 E	34 36 S	30	24	16
Fair and ſerene	N by E to N N W a fine Gale		0 22 W	29 48 E	34 54 S	30	25	17
Fair and ſerene, this forenoon cloudy	N to N N W	47 00 S	1 19 W	33 27 E	34 59 S	30	25½	18
Thick and ſqually this forenoon fair	N N W to S W and S by W			36 25 E	34 44 S	38	34	19
Fair and cloudy	S W to N W eaſie		6 25 W	37 45 E	34 22 S	31½	26	20
Fair and cloudy	N W by N to W eaſie			39 04 E	34 29 S	33	28	21
Fair and ſometimes ſqually	W to S S E fine			41 31 E	34 08 S	42	37	22
Variable Weather	S to W S W fine		7 05 W	43 41 E	34 35 S	36	39	23
Fair and pleaſant	S S W W to W ſmall		8 20 W	45 06 E	34 08 S	32	26½	24
Variable	S W by S to S E by S eaſie		8 52 W	47 02 E	33 58 S	30½	27	25
Fair and cloudy	S E by S to S by W moderate		9 43 W	48 32 E	33 35 S	26½	25½	26
	[illegible] by S to S moderate		10 39 W	49 56 E	33 51 S	29	27	27

D.

Day of the Month.	Therm. Altitud below extream Heat.	Philoſ. Barom. Altitud	Latitude N. or S.	Longitude Eaſt from St Jago	Needles Variation E. or W.	Needles Inclin. or Depreſſion of the N. or S. point under the Horizon.	Winds.	Weather.
28	35 ½	30 ½	34 03 S	50 36 E			S W by S to S by W ſmall	Fine moderate Weather
29	33	34 ½	34 03 S	50 36 E			S E ſmall, ſometimes freſh	Fair and pleaſant
30	30	31	34 03 S	50 36 E		48 00 S	S W to S E moſt part calm	Fair and pleaſant
31	26	25	34 03 S	50 36 E			Variable Breezes and calm	Fair and pleaſant
April 1			At the	Cape			S to S E ſmall	The ſame
2				of			S E ſmall	The ſame
3			Good	Hope			S E and S E by S moderate	The ſame
4							S E and S S E ſmall and calm	The ſame
5							S E by S ſmall, at night freſh	The ſame
6							S E ſmall	The ſame
7							Variable and calm	The ſame
8	30 ½	34					Calm, at night blowing freſh	The Forenoon foggy, Afternoon clear'd up
9				Longitud from the			S S E and S by E blowing hard	Fair and hazy
10				C. of Good Hope			S S E fine Gales	Fair and pleaſant
11	31	29	34 45 S	00 43 W			S E by S to N E moderate	Fair and gray
12	26	28	35 01 S	00 25 W	11 29 W		Variable and ſmall	Fair and cloudy
13	33	42 ½	35 30 S	00 08 W			S S E to S E by E moderate	Squally
14	34 ½	44 ½	36 52 S	00 36 W			S E to E by N	Variable
15	25 ½	29	37 51 S	00 13 W			E to E N E ſmall	Fair and cloudy
16	27	31 ½	37 57 S	01 03 E	12 40 W		S by E to S W by S ſmall ſometimes calm	Variable
17			37 41 S	2 38 E			S S W to E S E	Variable
18	31	38	38 45 S	3 29 E			E by S to E N E ſmall	Fair and cloſe
19	26	34	39 53 S	4 50 E			E by S to N E by N moderate	Fair and cloudy
20	31	39	40 42 S	5 58 E			N E by E to E by S moderate	Cloudy and overcaſt
21	32 ½	34	41 06 S	7 49 E			N E by E to N E by N eaſie	Moderate Weather
22	40	45 ½	39 52 S	10 06 E			W S W to S E freſh	Variable
23	38	44	38 51 S	11 34 E	19 06 W		S E to S S E ſmall	Fair and cloudy
24	32	33 ½	39 09 S	11 50 E			S E to N N E ſmall	Fair and pleaſant
25	39 ½	41	39 14 S	14 37 E			Variable Gales	Fair and cloudy

Weather.	Winds.	Needles Inclin. or Depreſſion of the N. or S. point under the Horizon.	Needles Variation E. or W.	Longiudte Eaſt from the Cape of Good Hope.	Latitude N. or S.	Philoſ. Barom. Altitude	Therm. Altitude below Extream Heat.	Day of the Month.
Variable with Rain and Hail	W by N to S W blowing hard			17 06 E	38 00 S	55	46	26
Cloſe and cloudy	S W by S to W N W freſh	8o 60 00 S		19 10 E	37 41 S	45	36	27
Fair ſomewhat cloudy	W N W to N W by N moderate		21 23 W	21 35 E	37 45 S	37	31	28
Variable	N W to S W eaſie			23 32 E	37 [illegible] S	36	25	29
Cloſe Weather	W S W to S E by S ſmall		22 27 W	23 57 E	37 30 S	33	23	30
Cloſe and cloudy	N N E to E ſmall			25 24 E	37 58 S	42	33	May 1
Cloſe	N E by E to N by E eaſie		24 30 W	27 00 E	38 16 S	45	32	2
Cloſe and Squally	N E by N to N N W freſh			29 40 E	38 47 S	40	32	3
Fair and cloudy	N N W to N W freſh			33 20 E	38 50 S	31½	30	4
Variable and ſqually	N W to S W freſh	7 60 00 S		36 20 E	38 43 S	37	37	5
Variable and Squally	N W to S W [illegible]			39 54 E	38 35 S	45½	3[illegible]½	6
Fair Weather	W N W to S W moderate	8 69 00 S		42 07 E	38 17 S	45½	30½	7
Variable	W N W to S W by W freſh		24 20 W	45 51 E	37 49 S	53	46½	8
Variable	W S W and W N W freſh			49 19 E	38 48 S	40	35	9
Variable	W by N to N W by W freſh	8 72 00 S	24 00 W	52 41 E	38 30 S	39	32	10
Moderate with ſome Rain	W N W and W freſh			56 08 E	38 09 S	46	35	11
The ſame	W to S W eaſie			58 16 E	37 25 S	42	32	12
Cloudy Weather	S W to N N E ſmall		20 48 W	59 11 E	37 25 S	47½	33½	13
Fair and pleaſant	W N W to N W by N ſmall	8 75 00 S	20 00 W	60 54 E	37 10 S	45½	34	14
Variable	W N W to S W fine Gales		19 00 W	63 29 E	37 13 S	38½	30	15
Cloſe and hazy with Rain	S W to W N W eaſie	6 70 00 S	18 43 W	65 04 E	36 53 S	41	34	16
Variable	W N W to N W freſh		17 40 W	68 14 E	36 48 S	36½	[illegible]	17
Fair and cloudy	W N W and W by N fine	8 68 00 S		71 12 E	30 56 S	41	[illegible]	18
Moderate	W N W and W freſh			74 16 E	30 00 S	41	35½	19
The ſame	N W by W to W fi[illegible]			70 39 E	35 01 S	34	31	20
The ſame	W by S to N W by N	8 68 00 S	4 28 W	78 32 E	34 07 S	37	33½	21
The ſame	N W by N and N W		14 00 W	81 0[illegible] E	33 07 S	25½	2[illegible]	22
Variable	N W by N to N E		13 30 W	83 30 E	32 53 S	24½	28½	23
Thick and ſqually	N by E to W by S			85 13 E	31 35 S	33	35	24
Variable	S W to W N W	8 68 00 S		86 28 E	30 11 S	30½	29½	25
Fair and pleaſant	S W by W and S W		10 04 W	87 06 E	29 27 S	34½	31	26

Day of the Month.	Therm. Altitud below Ex-tream Heat.	Philoſ. Barom. Altitud	Latitude N. or S.	Longitud Eaſt from the Cape of Good Hope.	Needles Variation E. or W.	Needles Inclin. or Depreſſion of the N. or S. point under the Horizon		Winds.	Weather.
27	31	35	28 01 S	87 59 E			d f.	S W to S E ſmall	The ſame
20	30	33	25 55 S	89 24 E	8 58 W			S E and S E by E	Variable
29	27	20	23 59 S	90 29 E				S E by E to S S E	Squally & Rainy with Thunder & Lightning
30	25	24	22 49 S	91 32 E	8 12 W	62 00 S	8	S E and S E by E	Variable
31	22	22	21 23 S	92 42 E	7 00 W			S E to S S E	Fair and ſerene
June 1	19	19	19 54 S	93 20 E	6 35 W			S E and S E by E	Fair and pleaſant
2	17	17	18 02 S	94 10 E				S E by E and E S E	The ſame
3	14	13	16 30 S	94 55 E	4 40 W			S E by E and E S E	The ſame
4	12	10	15 02 S	95 15 E	4 50 W	53 00 S	7	E by S to E by N	The ſame
5	7½	7	13 40 S	95 34 E	5 12 W			E by N to E by S	The ſame
6	5	3	13 01 S	95 42 E	5 20 W	52 00 S	4	E to N E by E	The ſame
7	5	3	12 59 S	95 56 E	5 15 W			E by N to E S E	The ſame
8	5	3	12 26 S	96 17 E	4 42 W			E by N to S E	The ſame
9	5½	1	11 43 S	96 28 E	4 26 W			E S E to E N E	The ſame
10	5	1	11 10 S	96 34 E	3 52 W			E by N and E	The ſame
11	4	0	10 18 S	96 54 E	3 32 W			E by N to E S E	The ſame
12	5	1	8 45 S	97 31 E	3 26 W	46 00 S	6	E by S to E S E	The ſame
13	5½	1	7 52 S	97 21 E	3 12 W			E by S to N N E	The ſame
14	4½	0	7 23 S	95 56 E				E S E to N N E	The ſame
15	5	0	6 45 S	95 16 E				S S E to S E	The ſame
16	4	0		Betwixt				S S E, S S W and calm	The ſame
17	2½	0		Java-Head				S S W, S E and calm	The ſame
18	2	0		and				S E and E by S	The ſame
19	2	0		Batavia				E N E and S E	The ſame
20	1	0						N E by E to S S E	The ſame
21	1	0		Longitud from Batavia		40 00 S	3	N N E to S	The ſame
22	1½	0		00 05 W				N to S S E	The ſame
23	4½	0	5 27 S	00 47 E				N W by W and S W	The ſame
24	2	0	5 24 S	1 48 E				S by W and S E by E	Cloudy with ſome Rain
25	3	0	5 51 S	1 55 E				E S E to N E by E	Squally with Thunder Lightning and Rain
26	6½	2½	6 12 S	1 51 E		38 00 S	4	E S E to N E by E	Cloudy with Rain
27	5	0	6 16 S	1 59 E				Calm	The ſame
28	5	0	6 29 S	2 02 E				E by N to E S E ſmall	Variable
29	5	0	6 21 S	2 18 E				E S E and S E ſmall	Fair
30	5	0	6 29 S	2 33 E				Variable Breezes	Uncertain
July 1	4	0	6 44 S	2 43 E				E by S to N E by E	Fair with ſome Rain
2	4½	0	6 39 S	2 55 E				N E by E to S E by E	Fair with ſome Rain
3	3½	0	6 35 S	3 34 E				N E by E to S E by E	Fair and ſerene
4	[illegible]	0	6 20 S	[illegible]					

Weather.	Winds.	Needles Inclin. or Depreſſion of the N. or S. point under the Horizon.		Needles Variation E or W	Longitud East from Batavia	Latitude N or S	Philoſ. Barom. Altitud	Therm. Altitud below Extream Heat.	Day of the Month
The ſame	S E ſmall	u. f.			4 07 E	6 12 S	2	8	6
The ſame	S E by S to E				4 28 E	6 21 S	0	6	7
The ſame	S E by E to E N E				4 43 E	6 22 S	0	6	8
The ſame	E by S to E by N				5 13 E	6 28 S	1	6	9
The ſame	E by E to E by N	2	41 00 S	1 25 W	5 37 E	6 50 S	3	8½	10
The ſame with ſome Rain	E N E to S S E				5 47 E	6 44 S	0	6	11
Fair and ſerene	E by N to S E				6 05 E	6 23 S	½	5	12
The ſame	S E to E by S				6 17 E	6 05 S	0	5	13
The ſame with ſome Rain	S E to E S E				6 54 E	5 10 S	2	6	14
Fair and cloudy	S E by S to E S E				7 09 E	4 20 S	0	4	15
Fair and ſerene	S E by E to N E by E				7 27 E	4 08 S	0	5	16
Fair and cloudy	E to S E and calm		At the Banjar on	Bar of Borneo	7 30 E	4 00 S	0	5	17
Cloſe and cloudy with Rain	E to S E by S ſmall				7 30 E	4 00 S	4	8	18
Cloſe and clearing up	S E freſh				7 30 E	4 00 S	1	7½	19
Fair and ſerene	S S E to S E	0	40 00 S		7 06 E	4 15 S	0	6	20
Fair and cloudy	S E by S and S E				5 08 E	4 51 S	0	5	21
The ſame	S E by E to E by S				3 12 E	4 59 S	0	2½	22
Cloſe with ſome Rain	S by E to E by S				1 25 E	4 45 S	0	4	23
Squally with Thunder	Variable				0 17 E	4 09 S	4	7	24
Fair and cloſe with Lightning	S to E by S	6	35 00 S		0 13 E	4 01 S	0	5	25
Fair and ſerene	E by S to S E by S					3 32 S	0	1½	26
Variable	E N E to S by E				In the	Streights	0	3	27
Fair and ſerene	S E by S to S				of	Banca	0	5	28
The ſame	S E by E to S					1 59 S	0	4½	29
The ſame	S E to N N E			1 50 W	Longitud	0 31 S	0	4	30
The ſame	S S E to S E by S	5	31 00 S	from Pulo	Condore	1 25 N	0	4	31
Fair and cloſe	S S E to S by W				1 36 W	3 19 N	0	2½	Aug. 1
Variable with Thunder and Lightning	S by W to S E				0 52 W	5 07 N	0	1	2
Fair and cloſe	Variable				0 25 W	6 04 N	0	1	3
Fair and pleaſant	S S W to S W by S				0 08 E	7 47 N	0	1	4
Fair cloſe and hazy	W to S W				1 25 E	9 16 N	0	3½	5
Fair and hazy	S W by W to W				3 07 E	10 14 N	0	2	6
Fair and ſerene	S W by W to S W by S	13	5 30 S		4 33 E	12 04 N	0	1	7
The ſame	S W and S W by W	12	4 00 S		5 58 E	14 05 N	0	1	8
Fair and cloudy	W by S to S W by S				7 02 E	16 15 N	0	1½	9
Squally	Variable				7 20 E	18 14 N	0	2½	10
Squally and much overcaſt	W S W to W N W blowing hard				7 12 E	19 49 N	0	1½	11

Day of the Month	Therm. Altitud below Extream Heat.	Philoſ. Barom. Altitud	Latitude N or S	Longitude Eaſt from Pulo Condore.	Needles Variation E. or W.	Needles Inclin. or Depreſſion of the N. or S. point under the Horizon.	dif.	Winds.	Weather.
13	1½ above	Extr. Heat	21 58 N	7 36 E				S S W to S E by S ſmall	Fair and ſerene
14	1 below	0	22 15 N	7 47 E		6 00 N	2	S E to N N E	Fair and pleaſant with one Shower
15	1	0	22 18 N	8 09 E				E by N to N E by E	Fair and pleaſant
16	0	0	22 32 N	8 43 E	1 20 W			Variable and calm	The ſame
17	½	0	23 10 N	9 48 E				W S W to S W eaſie	Fair, with ſome drizling Rain
18	1½	0	23 32 N	10 04 E				Variable and ſmall	Fair and ſerene
19	2½	0	23 56 N	10 18 E				N to N E by N freſh	The ſame
20	4	0	24 12 N	10 28 E				N by E to N E by N	Fair and hazy
21	1	0	24 22 N	10 43 E		12 00 N	6	N E by E to N by E	The ſame
22	3	0	24 32 N	11 01 E				N E to N N E	The ſame
23	4½	0	24 47 N	11 15 E				N E by E to N N E eaſie	Fair and pleaſant
24	6	0	24 56 N	11 28 E				E N E to N E by N freſh	Variable
25	5	0	25 09 N	11 38 E				E N E to N by E moderate	Fair and pleaſant
26	6	0	25 09 N	12 08 E				N by E to N E by E	The ſame
27	5	0	25 07 N	12 20 E				E N E to N N E	The ſame
28	5	0	25 29 N	11 50 E				E by N to N N E	Variable
29	4	0	25 37 N	12 02 E				N E by E to N	Variable
30	3½	0	25 49 N	11 47 E				N by E to N E by E freſh	Cloſe and Squally
31	2	0	26 02 N	11 53 E				N E by N to E by N	Variable
Sept. 1	2½	0	26 05 N	11 56 E				N N E to N E by E	Fair and pleaſant
2			At Crocodile Iſland					N E ſmall	The ſame with ſome Rain at night
3								N N E ſmall	Fair and pleaſant
4								N by E to N E	The ſame
5								N E moderate	Fair and cloudy
6								N E freſh, at night S W blowing hard	The ſame, at night much Rain
7								N E freſh and moderate	Cloudy with ſome Rain
8								N E moderate	Fair and pleaſant, at times overcaſt
9	3	0	25 44 N	12 38 E				N E moderate	Fair and hazy
10	3½	0	26 11 N	12 13 E				N E by N to N E by E	The ſame
11	5	0	26 11 N	12 47 E				N E to N N E	The ſame
12	4½	0	26 22 N	12 37 E				N E by N to E by S ſmall	Fair and pleaſant
13	8½	0	20 26 N	12 40 E				E N E to N E mode	Fair

Weather.	Winds.	Needles Inclin. or Depreſſion of the N. or S. point under the Horizon.		Needles Variation E. or W.	Longitude Eaſt from Pulo Condore.	Latitude N. or S.	Philoſ Barom. Altitud	Therm Altitud below Extream Heat.	Day of the Month.
r cloſe and cloudy	N E by E to E by N	dif.			13 11 E	27 05 N	0	5	15
r and cloudy	E N E to N by W				14 01 E	26 55 N	0	7	16
e ſame	N to N E by E				14 13 E	27 07 N	0	8	17
riable	N E to N by E				14 13 E	27 26 N	7½	10	18
	N by E to N E by E				14 02 E	27 42 N	6½	9	19
r and cloudy	N E by E to N by E freſh				14 25 E	27 46 N	4	7½	20
r and pleaſant	N E to N N E moderate				14 25 E	28 03 N	10	12	21
r with ſome Rain	N E by N to N by E				15 31 E	27 49 N	12½	15	22
s and cloudy	N N E to N freſh				15 01 E	27 51 N	14	17	23
r and much over aſt	N by W to N by E ſmall				16 26 E	27 53 N	13	14	24
y and cloſe	N by E to N E by N				15 30 E	28 10 N	12	14	25
iable	N by E to E by N				15 04 E	28 47 N	13	13½	26
r and pleaſant	N N E to N E by E	5	17 30 N		14 49 E	29 06 N	13	14	27
r and cloudy	N N E to N E				15 09 E	28 55 N	17	15½	28
r, ſometimes cloſe	N E by N			1 00 E	15 09 E	29 02 N	13	15	29
pleaſant and loudy	Variable from S S E to N W				15 19 E	29 43 N	17	15	30
and cloſe	W N W to N E by E				14 55 E	29 56 N			Octob. 1
ck and foggy with ain	N N W and N ſmall				14 55 E	29 56 N			2
iable, forenoon ſe ne	N N W to N W ſmall								3
iable	N to N E moderate								4
and cloudy	N N W to NW blowing freſh								5
and ſerene	Forenoon calm, afternoon S E freſh								6
udy with Rain	N N E to N E moder.								7
udy and overcaſt	N to N N W								8
udy and hazy with Rain	N by W to N E								9
udy and fair	N E to S E moderate				14 55 E	29 56 N	20	20	10
r and ſerene	S E to S W ſmall				14 20 E	30 25 N	1	12	11
e ſame	S W ſmall		A	Cnuian	14 20 E	30 25 N	15	17	12
r and cloudy	N N E to N E						32	25	13
r and cloudy	N E moderate		21 00 N	00 56 E	14 20 E	30 25 N	30	24	14
r and cloudy	N ſmall						28	22	15
udy with ſome Rain	N E to E moderate						29	25	16
ck and hazy with Rain	S E ſmall						14	16	17
ck and hazy with	S E moderate						13	15	18

Day of the Month.	Therm. Altitud below Ex-tream Heat.	Philoſ. Barom. Altitud	Latitude N or S	Longitud Pulo from Condore.	Needles Variation E or W	Needles Inclin. or Depreſſion of the N or S point.	Winds.	Weather.
19	23½	31					N E ſmall	Fair and cloudy
20	24	30					N N E to E N E	The ſame
21	24	29					N N E to S E	Cloudy with ſome Rain
22	25	30					N to N W freſh	Fair and cloudy
23	26	30					N by W to W N W ſmall	Fair and pleaſant
24	27½	32					S and S S E ſmall	The ſame
25	24	28					S E moderate	The ſame
26	22½	26					S E to S by E moderate	The ſame
27	20	27					N W to N by W moderate	Cloudy with ſome Rain
28	36½	45					N W ſmall, ſometimes freſh	Thick and hazy wi Rain
29	45	58					N W to N moderate	The ſame
30	46	59					N N W to N by E ſmall	Fair and cloudy
31	47	65					N W ſmall	The ſame

Note 1. That the Altitude of the Spirits in the Thermometer and Philoſophica Barometer was commonly taken at Noon.

Note 2. That the account of the Winds and Weather at Sea, is from Noon t Noon.

Note 3. That the middle Inclination of the Dipping Needle is ſet down wit the difference alſo which was made, as either ſide of the Compaſs was turn'd Eaſ or Weſt: Which difference at firſt was not taken notice of. From whence thi difference ſhould ariſe, I cannot determine, the Compaſs ſeeming to be juſtl pois'd and equally divided.

For the few Chaſmata in the Columns of the Thermometer and Barometer there needs no other Apology, than that I was not on board to take an account o them my ſelf.

V.

V. *A Regiſter of the Winds and Weather, with the Obſervations of the Mercurial Barometer, at* Chuſan, *an Iſland in* 30°. 25'. *N. Latitude upon the Coaſt of* China. *By Mr* James Cuningham. *F. R. S.*

NOT. 1. That the following Obſervations were of a Portable Barometer from *England*; which by a Barometer ſet up here were always $\frac{6}{10}$ of an inch lower.

Not. 2. That the Barometer ſtood about 18 feet above the *Superficies* of the Sea at high Water.

NOVEMBER. 1700.

1. Grey cloudy Weather, very cold and moderate Gales from N W to N.

2. Grey cloudy Weather with moderate Gales from N W to N, and very cold.

3. Grey cloudy Weather, very cold and ſmall Gales from N by W and N N W. At night little Wind and more ſerene.

4. Grey cloudy Weather, very cold and moderate Gales at N N W and N by W.

5. Fair and ſerene Weather with ſmall Gales from N N W to N. The Air temperate.

6. Fair and pleaſant Weather, with ſmall Gales at N W and N N W.

7. Fair and pleaſant Weather, ſomewhat hazy, and ſmall Gales at N N W At night calm.

8. Fair and pleaſant Weather, with ſmall Gales at N. At night little Wind.

9. Fair and ſerene Weather, with ſmall Gales at N. At night calm.

10. Very ſerene and warm Weather, with ſmall Gales at N by W. In the night calm.

11. Dry and ſerene Weather, with ſmall Gales from S E. At night calm.

12. Dry and ſerene Weather, with ſmall Northerly Breezes. At night calm.

13. The morning foggy, all day ſerene with ſmall Breezes at N N W.

14. The morning grey and cloudy, towards noon thick hazy Weather with drizling Rain till 8 at night. All day freſh Gales from W by S to N W. At night leſs Wind and fair.

15. Grey cloudy Weather with moderate Gales from N W to N.

16. Fair and pleaſant Weather with ſmall Gales from N to N by E.

17. Dry and ſerene Weather with ſmall Gales at N and N N W.

18. Grey cloudy Weather, with moderate Gales from N W to W. In the night cold.

19. Dry Weather ſomewhat cloudy, with ſmall Gales from N W to N. Cold at night.

20. Dry and pleaſant Weather, with ſmall Gales at N N W.

21. Fair and pleaſant Weather, with ſmall Gales from W by S to N W.

22. Fair and pleaſant Weather, ſomewhat hazy with Gales at S E.

23. Fair and pleaſant Weather, the afternoon overcaſt, with moderate Gales at N W to N.

24. Dry Weather, ſomewhat cloudy, with moderate Gales from N W to N.

25. Fair and pleaſant Weather, with ſmall Gales from N by W. At night calm and cold.

26. Fair and pleaſant Weather, with ſmall Breezes at N W for the moſt part calm. ☿ Altitude $30\frac{6}{20}$.

27. Grey cloudy morning, with ſmall Gales at W N W. ☿ Altitude $30\frac{6}{20}$. In the afternoon fair and pleaſant with ſmall Southerly Breezes. At night calm.

28. Fair and pleaſant Weather, with ſmall Gales at N W. ☿ $30\frac{6}{20}$. The Afternoon ſmall Breezes at S W. At night calm, and the Breezes veering to N, the Air temperate. ☿ $30\frac{4}{20}$.

29. Fair and ſerene Weather, with Calms. ☿ $30\frac{5}{20}$. In the afternoon ſmall Gales at S E. At night grey cloudy Weather, the Gale veering to N. ☿ $30\frac{6}{20}$.

30. A grey cloudy morning, with moderate Gales at N W and W N W. ☿ $30\frac{6}{20}$. All day more ſerene. In the evening overcaſt, and ſome Rain at 9 of the night.

DECEMBER 1700.

1. Grey cloudy Weather all day and night, with freſh Gales from N to N E. ☿ $30\frac{9}{20}$ falling to $30\frac{8}{20}$.

3. In the morning fair and ſerene. ☿ $30\frac{5}{20}$. Since overcaſt and grey cloudy Weather, with moderate Gales at N N E and N. In the evening ſome Drops of Rain, and ſometimes blowing freſh in the night and very cold.

4. Grey cloudy Weather, with moderate Gales at N to N W. ☿ $30\frac{12}{20}$, at night falling to $30\frac{11}{2}$, then almoſt calm.

5. A grey cloudy morning, towards Noon more ſerene. ☿ $30\frac{11}{20}$. Freſh Gales at N E. In the evening overcaſt with ſome drops of Rain. Little Wind all night.

6. A grey morning ſomewhat cloudy, and a ſmall Breeze at N N E. ☿ $30\frac{9}{20}$. In the Afternoon overcaſt, with the Wind at S, and ſmall drops of Rain. The ☿ falling to $30\frac{8}{20}$. Some Rain in the night.

7. Cloſe thick Weather with drizling Rains all day and night, and ſmall Winds at N N E and N ☿ $30\frac{7}{20}$.

8. A grey cloudy morning with ſome drizling Rain, and moderate Gales at N and N by W ☿ riſing above $30\frac{7}{20}$. All day and night overcaſt ; the ☿ as before.

9.

9. A grey cloudy ſharp morning, and ſmall Winds at N N W ☿ $30\frac{6}{20}$. Cloudy all day, and towards evening cloſe Weather and calm, ☿ $30\frac{5}{20}$.

10. Dry Weather ſomewhat grey and cloudy with ſmall brezees at N N W ☿ $30\frac{4}{20}$. All day overcaſt with variable breezes intermixt with Calms, ☿ as before.

11. Fair and pleaſant in the morning, ſince overcaſt with variable breezes, the ☿ as before.

12. Grey cloudy Weather, in the Forenoon ſmall Gale at S E ☿ $30\frac{4}{20}$. In the afternoon the Gale freſhning at N W ☿ $30\frac{5}{20}$. With ſome Rain all night.

13. Grey cloudy Weather, with moderate Gales from N W to N ☿ $30\frac{4}{20}$. Cold at night.

14. A ſharp morning and fair pleaſant Weather, with ſmall Gales at N N W and N ☿ $30\frac{6}{20}$. At night Calm ☿ $30\frac{5}{20}$.

15. Fair and pleaſant Weather, with moderate Gales at S E ☿ $30\frac{4}{20}$ falling to $30\frac{3}{20}$.

16. The morning ſomewhat cloudy, with ſmall Gales at S E (☿ $30\frac{2}{20}$.) At noon veer'd to N W, and the Sky overcaſt; at night ſome Rain, much Wind and Cold.

17. A ſharp morning and grey cloudy Weather, with moderate Gales from N W to N N W ☿ $30\frac{7}{20}$. All day overcaſt, at night little Wind and much Rain.

18. Thick cloſe Rainy Weather, all day and night with ſmall Gales at N W.

19. Grey cloudy Weather, with moderate Gales at N W to N ☿ $30\frac{6}{20}$. Some Rain at night and very Cold.

20. Grey cloudy Weather, with moderate Gales at N N W, and cold ☿ $30\frac{7}{20}$. At night little Wind.

21. Grey cloudy Weather and cold, with moderate Gales from N N W to N W ☿ $30\frac{7}{20}$. At night drizling Rains. ☿ $30\frac{6}{20}$.

22. In the morning cloſe Weather, with drizling Rains and moderate Gales at N W and N N W ☿ $30\frac{6}{20}$. The afternoon dry, grey and cloudy.

23. A grey cloudy morning and Calm ☿ $30\frac{1}{20}$, towards noon more ſerene and a ſmall breeze at E S E. In the evening overcaſt with ſome Rain and freſh Gales, all night at N N W.

24. Grey cloudy Weather, ſomewhat cloſe, with freſh Gales from N N W to N W by W.

25. Grey cloudy Weather, with moderate Gales at N W.

26. Cloſe Weather with drizling Rains, and ſmall breezes at N E, for the moſt part calm. In the night the Gale freſhned at N. ☿ $\frac{6}{20}$.

27. The forenoon grey cloudy Weather, and ſmall Gales at N N E. ☿ $30\frac{2}{20}$. The afternoon and all night cloſe Weather with drizling Rains, the breeze veering to E N E.

28. Grey cloudy Weather with ſome drizling Rains, and ſmall Northerly Gales. ☿ at $30\frac{7}{20}$.

29. In the morning ſomewhat fair, then overcaſt with drizling Rains and cloſe Weather all day and night, ſmall Gales from N N E. to N E. ☿ $30\frac{6}{20}$.

30. A grey cloudy morning, with Gales at E N E ☿ $30\frac{7}{20}$. All day the foreſaid Weather.

32. In the morning fair and pleaſant, with ſmall Gales at S E. ☿ $30\frac{5}{20}$. In the forenoon overcaſt ☿ falling to $30\frac{3}{20}$. The afternoon and night cloſe thick foggy Weather, with ſome drizling Rain and calm.

JANUARY, 1701.

1. Dry Weather ſomewhat cloſe, with ſmall Gales at S E. ☿ $30\frac{1}{20}$. The afternoon overcaſt and cloſe Weather, with ſmall Gales at E S E ☿ falling to $29\frac{19}{20}$, and much Rain in the night.

2. Cloſe Weather and drizling Rains, with moderate Gales at N N E ☿ $30\frac{1}{20}$. At night blowing freſh, ☿ riſing to $30\frac{3}{20}$.

3. Cloſe and cloudy Weather with drizling Rain, and moderate Gales at N. ☿ 30 $\frac{5}{20}$.

4. A grey cloudy morning, with moderate Gales at N E. ☿ 30 $\frac{1}{20}$ afternoon cloſe and thick Weather, with drizling Rains, ☿ 30. Much Rain in the night.

5. Thick cloſe Rainy Weather, with moderate Gales at N E. ☿ 30 $\frac{3}{20}$. At night fair and cold.

6. A grey cloudy morning, with freſh Gales at N E, ☿ 30 $\frac{6}{20}$. At noon 30 $\frac{7}{20}$. At night 30 $\frac{6}{20}$, and ſome Rain.

7. Cloſe and cloudy weather, in the morning. ☿ 30 $\frac{5}{20}$, towards noon drizling Rains, and encreaſing in the afternoon, with ſmall Winds at N E. ☿ 30 $\frac{4}{20}$.

8. Thick cloſe and cloudy weather, with drizling Rains and ſmall Gales at N E. ☿ 30 $\frac{2}{20}$.

9. Cloſe and cloudy weather, with drizling Rains and ſmall Gales at E S E ☿ 30 $\frac{4}{20}$. At night fair. ☿ 30 $\frac{6}{20}$.

10. A grey cloudy morning with freſh Gales at N. ☿ 30 $\frac{7}{20}$. In the evening and all night Rainy weather.

11. A cloſe and cloudy morning with drizling Rains and ſmall Gales at N. ☿ 30 $\frac{1}{20}$. All day the aforeſaid weather.

12. Thick cloſe Rainy weather all day and night, with moderate Gales at N N W. ☿ 30 $\frac{2}{20}$, Much Rain at Night.

13. Very thick cloſe Rainy weather, with freſh Gales at N W. ☿ 30. In the night cold.

14. A ſharp cold morning, with much Snow falling and cloſe weather, with freſh Gales at N W. ☿ 30 $\frac{2}{20}$. Continu'd Snowing a little all day and night following. ☿ 30 $\frac{3}{20}$.

15. Fair weather, freezing hard, with ſome Sun ſhining, and freſh Gales at N N W and N by W. ☿ 30 $\frac{5}{20}$.

16. Fair and ſerene weather all day and night, freezing hard, with moderate Gales at N N W. ☿ 30 $\frac{7}{20}$. The Sun melting the Snow.

17. Fair and ſerene weather, (the Sun diſſolving moſt of the Snow) with freſh Gales at N by W. ☿ 30 $\frac{9}{20}$. At night ſomewhat cold, freezing hard.

18. Grey cloudy weather, freezing hard, with moderate Gales at N by W, ☿ 30 $\frac{11}{20}$. At night riſing to 30 $\frac{12}{20}$.

19. Grey cloudy weather, with little Froſt, and moderate Gales at N N W ☿ 30 $\frac{10}{20}$.

20. Grey cloudy Weather, ſomewhat cloſe, with moderate Gales at N N W. ☿ 30 $\frac{9}{20}$, freezing in the morning, and inclining to thaw at night.

21. In the morning ſomewhat ſerene, the reſt of the day overcaſt, with moderate Gales at N W, and ſome thaw. ☿ 29 $\frac{9}{20}$.

22. Fair and ſerene weather, with ſmall Gales at W N W ☿ 30 $\frac{7}{20}$, thawing all day with the heat of the Sun, at night cold, but not freezing, ☿ as before.

23. Grey and cloudy weather, with ſmall Gales at S E, thawing a little ☿ 30 $\frac{5}{20}$. At night much Rain and calm, ☿ 30 $\frac{4}{20}$.

24. A Fair and ſerene morning, with ſmall Gales at N N W and N: ☿ 30 $\frac{4}{20}$. All day overcaſt, and drizling Rains all night.

25. Cloſe hazy Weather, with drizling Rain and no Wind. ☿ 30 $\frac{4}{20}$. At night much Rain.

26. Very cloſe hazy weather, with drizling Rains and ſmall Breezes at S E. ☿ 30 $\frac{2}{20}$. In the afternoon falling to 29 $\frac{18}{20}$, at night much Rain, the Wind veering to N N W. blowing ſometimes in Guſts.

27. Cloſe weather, with drizling Rains and moderate Gales at N W. ☿ 30 $\frac{2}{20}$. In the afternoon fair, and at night freezing.

28. Grey cloudy weather, freezing hard all day, with moderate Gales from N W to N, ☿ 30 $\frac{4}{20}$. *This day being New Moon, begun the* Chineſe *New Year.*

29. Fair and ſerene froſty weather, with moderate Gales at N by W. ☿ $30\frac{6}{20}$.

30. The morning fair and ſerene, all day overcaſt with moderate Gales at N to N W ☿ $30\frac{7}{20}$. Froſty Weather.

31. Fair and ſerene weather, freezing hard, with moderate Gales at W N W. ☿ $30\frac{7}{20}$.

FEBRUARY, 1701.

1. Fair and pleaſant weather, with ſmall Gales from W, veering to S S E, and at night to N N W, but no froſt. ☿ $30\frac{6}{20}$.

2. Fair and pleaſant weather, in the morning, little Wind, in the forenoon fine Gales at N W. ☿ $30\frac{8}{20}$, at night little Wind.

3. Dry weather, ſomewhat overcaſt, with ſmall Gales at N W. ☿ $30\frac{6}{20}$, at night little Wind.

4. Dry weather, ſomewhat cloſe, with ſmall Gales at S E. ☿ $30\frac{6}{20}$.

5. Fair and cloudy weather, with ſmall Gales at N W. ☿ $30\frac{4}{20}$.

6. The morning cloſe and overcaſt, the afternoon ſerene, with ſmall Gales at N W. ☿ $30\frac{5}{20}$.

7. Fair and cloudy weather, with ſmall Gales at N N W. ☿ $30\frac{6}{20}$.

8. Fair weather, ſomewhat cloudy, with variable Breezes round the Compaſs. ☿ $30\frac{6}{20}$.

9. Fair and pleaſant weather, with ſmall breezes at S E. ☿ $30\frac{7}{20}$. At night little Wind from N N W.

10. Cloudy weather, with moderate Gales at N by W, in the afternoon and all night drizling Rains. ☿ $30\frac{4}{20}$.

11. Cloſe weather, with drizling Rains and ſmall Gales at N by W, ☿ $30\frac{1}{20}$. All night much Rain.

12. Cloſe weather, with ſome drizling Rains and ſmall Gale at N by W and N N W. ☿ $30\frac{2}{20}$.

13. Fair and pleaſant weather, with ſmall Gales from N to S S E. ☿ 30 $\frac{5}{20}$.

14. Cloſe and cloudy Weather, with drizling Rains, and ſmall Gales at N N W. ☿ 30 $\frac{1}{20}$. Afternoon and night fair, pleaſant and calm, ☿ as before.

15. Fair and ſerene weather, and no Wind. ☿ 30 $\frac{3}{10}$. The afternoon overcaſt, with cloſe weather, and moderate Gales at S E, and ſome Rain, ☿ 30.

16. Cloudy weather and ſomewhat cloſe, with ſmall Gales at N N W. ☿ 29 $\frac{19}{20}$. In the night freſher Gales.

17. Grey cloudy weather, with moderate Gales at N N E. ☿ 30 $\frac{3}{20}$.

18. Grey cloudy weather, with moderate Gales at N. ☿ 30 $\frac{4}{20}$.

19. Grey cloudy weather, with moderate Gales at N N W. ☿ 30 $\frac{4}{20}$.

20. Grey cloudy weather, with ſmall Gales at N by W, ☿ 30 $\frac{6}{20}$. Very cold, with ſome Snow at night.

21. Gray cloudy weather, with ſmall Gales at N. ☿ 30 $\frac{9}{20}$. Some Snow this morning, whitening the tops of the Hills and lying all day.

22. In the morning ſome Sun-ſhining diſſolving the Snow; all day grey cloudy weather, and temperate with ſmall Gales at N N W. ☿ 30 $\frac{8}{20}$.

23. Dry weather, ſomewhat cloudy, calm in the morning, at noon blowing freſh from N W till night, then little Wind. ☿ 30 $\frac{6}{20}$.

24. Fair and pleaſant weather, with ſmall Gales at S E, the afternoon calm, at night moderate Gales from N N W. ☿ 30 $\frac{6}{20}$.

25. Fair and pleaſant, with moderate Gales at S S E and S E. ☿ 30 $\frac{6}{20}$.

26. Grey cloudy weather, with drizling Rains all day and night, and moderate Gales at S E. ☿ 30 $\frac{4}{20}$.

27. Fair weather, clearing up with ſmall Gales at S E.

28.

28. Fair and pleaſant weather, with ſmall Gales N W. In the afternoon veering to W S W, ând about to S E. ☿ 30 $\frac{6}{20}$.

MARCH, 1704.

1. Dry weather, ſomewhat cloudy, with moderate Gales at S E. ☿ 30 $\frac{5}{20}$.

2. The morning fair and very ſerene, the afternoon overcaſt with ſmall Gales at S E. ☿ 30 $\frac{60}{20}$.

3. The morning fair and ſerene, the afternoon overcaſt with moderate Gales at E S E and S E. ☿ 30 $\frac{8}{20}$.

4. Grey cloudy weather with moderate Gales at S E. At night blowing freſh from N E. ☿ 30 $\frac{4}{20}$.

5. Grey cloudy weather, with ſome Rain, and moderate Gales at S E. At night ſome Thunder, Lightning and Rain. ☿ below 30.

6. The morning ſerene and temperately warm, with ſmall Southwardly Breezes. The forenoon and all day overcaſt, in the afternoon ſome Rain, cloſe hazy weather with ſmall Gales at N by E and N. ☿ 30.

7. Grey cloudy weather with ſmall Gales at E S E. At night much Rain. ☿ 30.

8. Grey cloudy weather, ſomewhat hazy, with moderate Gales at N and N by E. ☿ 30 $\frac{4}{20}$.

9. Fair and pleaſant Weather in the forenoon, with ſmall Gales at S E. ☿ 30 $\frac{6}{20}$. The afternoon overcaſt, and little Wind all night. ☿ 30 $\frac{5}{20}$.

10. Dry weather, ſomewhat cloſe with ſmall Gales at S E, in the evening ſome Rain. ☿ 30 $\frac{4}{20}$. In the night much Wind and Rain.

11. Cloſe and cloudy weather, with ſmall Rains and moderate Gales at N N W. ☿ 30 $\frac{4}{20}$.

12. Cloſe and cloudy weather, with moderate Gales from S E to N E. ☿ 30 $\frac{4}{20}$.

13. Grey cloudy and cloſe weather, with ſome Rain and ſmall Gales at S E. ☿ 30.

14. Grey, cloudy and cloſe weather, with ſmall Gales variable from S E to N W. ☿ 30 $\frac{3}{20}$.

15. Very cloſe hazy weather, calm all day. ☿ 29 $\frac{17}{20}$. At night ſmall Gales at W N W with ſome Rain.

16. Cloſe and cloudy weather, with ſmall Gales from N W to N. ☿ 30.

17. Fair and ſerene weather, with ſmall variable Gales: ☿ 30 $\frac{4}{20}$.

18. In the morning overcaſt with moderate Gales at N W, preſently veering to S E, with drizling Rains all day. ☿ 30 $\frac{3}{20}$, falling to 29 $\frac{17}{20}$.

19. Grey cloudy weather, for the moſt part calm. ☿ 29 $\frac{18}{20}$.

20. Very thick foggy weather all day, with ſmall variable Breezes, for the moſt part calm. ☿ 29 $\frac{17}{20}$.

21. In the morning foggy, the reſt fair and ſerene weather, with ſmall Southwardly Gales. ☿ 29 $\frac{15}{20}$.

22. The morning fair and ſerene, the afternoon overcaſt with ſome Rain and variable Gales. ☿ 30.

23. Grey cloudy weather, the afternoon and all night drizling Rains and moderate Gales at N N E. ☿ 30.

24. Cloſe weather with continu'd drizling Rains, and at night much Rain with moderate Gales from N N E to N, and very cold. ☿ 30 $\frac{1}{20}$.

25. The morning ſomewhat cloudy, the afternoon ſerene, with moderate Gales at N. ☿ 30 $\frac{5}{20}$.

26. Dry weather, ſomewhat cloudy, with ſmall variable Gales. ☿ 30 $\frac{4}{20}$.

27. Grey cloudy weather, with ſmall variable Gales, ſometimes calm. ☿ 30 $\frac{2}{20}$.

28. Cloſe hazy weather, with ſome Rain and ſmall variable Gales, ſometimes calm. ☿ 29 $\frac{18}{20}$.

29. The forenoon grey cloudy weather, the afternoon very cloſe and hazy with much Rain. ☿ 29 $\frac{17}{20}$. Small variable Breezes, for the moſt part calm.

30

30. Cloſe and cloudy weather, with moderate Gales at N N E, ☿ 29 $\frac{18}{20}$. At night riſing to 30, and the Gale freſhning.

31. Fair weather, ſomewhat cloudy, with ſmall variable Gales, ☿ 30.

APRIL, 1701.

1. The forenoon overcaſt, afternoon more ſerene, with ſmall Southerly Gales, ☿ 30 $\frac{1}{20}$.

2. Fair and pleaſant weather, with ſmall Gales at S W. ☿ 30 $\frac{2}{20}$.

3. Grey cloudy weather, blowing freſh in the forenoon at N E, afternoon moderate, ☿ 30 $\frac{4}{20}$.

4. Fair and ſerene weather, the Horizon, ſomewhat cloſe, with eaſie Gales at S. ☿ 30 $\frac{4}{20}$. In the afternoon the Gale veer'd to W, and the Sky ſomewhat hazy.

5. Cloſe and cloudy weather, with ſome drizling Rain in the forenoon and ſmall Gales from S to E S E. The night calm and Rainy. ☿ 30.

6. Cloſe foggy weather, with drizling Rains and calm, ☿ 29 $\frac{19}{20}$.

7. Fair and pleaſant weather, ſomewhat cloudy and calm. In the evening ſmall Gales at E to N E. All night cloſe foggy weather, ☿ 29 $\frac{18}{20}$.

8. Cloſe foggy weather, with ſmall Northerly breezes, for the moſt part calm, ☿ 29 $\frac{16}{20}$.

9. The forenoon cloſe and cloudy, afternoon fair and pleaſant, with ſmall Gales at N. In the evening calm. ☿ 29 $\frac{16}{20}$.

10. Fair and pleaſant weather, ſometimes overcaſt, with ſmall Gales from S W to S. ☿ 29 $\frac{18}{20}$.

11. Fair and pleaſant weather, with ſmall Gales from S to S E. ☿ 30.

12. Fair weather, ſometimes overcaſt, with moderate Gales at N. ☿ 30 $\frac{2}{20}$.

13. Dry weather, ſomewhat hazy, with freſh ſharp Weſterly Gales, ☿ 30 $\frac{4}{20}$. In the evening ſerene and little wind. ☿ 30 $\frac{3}{20}$.

14. Fair and pleaſant weather, with ſmall Gales at S E. ☿ 30 $\frac{3}{20}$.

15. Fair and pleaſant weather, with ſmall Gales from S to S E. In the evening calm ☿ 30 $\frac{2}{20}$.

16. The forenoon fair and pleaſant, with moderate Gales at S E. ☿ 30 $\frac{2}{20}$. In the afternoon overcaſt, with ſome Rain and ſmall Gales at N W, ☿ 30.

17. The forenoon fair and pleaſant, with moderate Gales at S E. ☿ 30 $\frac{2}{20}$, the afternoon overcaſt and the Gale freſhning at night. ☿ 30.

18. Fair and pleaſant weather, ſomewhat cloudy, with ſmall Gales at S E, ☿ 30.

19. Cloudy weather, with a hazy Sky, and ſmall Gales at S E. ☿ 29 $\frac{18}{20}$.

20. Dry cloudy weather, with fine Gales at S E. ☿ 29 $\frac{17}{20}$.

21. Grey cloudy weather, with ſome Rain in the forenoon, and ſmall breezes at S E, for the moſt part calm; the afternoon fair. ☿ 29 .

22. Cloſe and cloudy weather, with hazy and calm, in the afternoon ſome Rain and ſmall breezes at S E. ☿ 29 $\frac{16}{20}$.

23. Dry weather, ſomewhat foggy and cloudy, with ſmall Gales at S E, ☿ 29 $\frac{16}{20}$. In the evening thick foggy weather.

24. Grey cloudy weather ſomewhat foggy, with moderate Gales at S E. ☿ 29 $\frac{17}{20}$. At night much fogg.

25. Cloudy and foggy weather, with fine Gales at S E. ☿ 29 $\frac{15}{20}$. At night much Rain, Thunder and Lightning, with little Wind. ☿ 29 $\frac{14}{20}$.

26. Cloſe and cloudy weather, with ſmall Gales at N W. ☿ 29 $\frac{16}{20}$. In the afternoon ſomewhat hazy with ſmall drizling Rain.

27. The weather clearing up with eaſie Gales at S E. ☿ $29\frac{17}{20}$. The afternoon overcaſt, and in the evening much Rain with ſome Thunder and Lightning, the Wind veering to N W, and back to S E $29\frac{15}{20}$.

28. Grey cloudy weather, with ſome Fogg, and ſmall Gales from W to N W. ☿ $29\frac{17}{20}$.

29. Cloſe and cloudy weather, with ſmall Gales from N W to N. ☿ $29\frac{17}{20}$. At night ſome Rain.

30. Grey cloudy weather, ſomewhat cloſe, with freſh Gales at N W. ☿ $29\frac{17}{20}$.

MAY.

1. A fair and ſerene morning, with ſmall breezes at W by S. ☿ $29\frac{18}{20}$. All day and night fair and pleaſant, with ſmall breezes at N W. ☿ $29\frac{19}{20}$.

2. Fair and ſerene weather, with ſmall breezes at S E, and ſometimes calm. ☿ 30^{d}. In the afternoon and all night freſh Gales.

3. The weather ſomewhat cloudy, with freſh Gales at S E. ☿ $29\frac{17}{20}$. In the afternoon falling to $29\frac{14}{20}$. The Wind veering to W N W, had much Rain with Thunder and Lightning all night.

4. The morning cloſe foggy weather, almoſt calm. ☿ $29\frac{17}{20}$. The afternoon clear'd up, blowing freſh from N to N E. ☿ $30\frac{1}{20}$.

5. Fair and pleaſant weather, ſomewhat cloudy, with moderate Gales at S E. ☿ 30^{d}.

6. Fair and pleaſant weather, ſomewhat cloudy, with moderate Gales at S E. ☿ $29\frac{19}{20}$. Towards noon little Wind. In the afternoon a fine Gale at S E by E, and at night thick foggy weather. ☿ $29\frac{12}{20}$.

7. Grey cloudy weather, ſomewhat foggy, with ſmall Gales at S E, ☿ below $29\frac{18}{20}$.

8. Fair and pleaſant weather, ſomewhat foggy on the Hills, and ſmall variable breezes from S W to N W. ☿ $29\frac{18}{20}$. At night much fog.

9. Fair and pleaſant weather, with ſome fog on the Hills, with ſmall variable breezes from S W to N W. ☿ 30^{d}. The afternoon ſerene.

10. The forenoon fair and pleaſant, ☿ falling from $29\frac{18}{20}$ to $29\frac{17}{20}$. The afrernoon overcaſt with ſmall Gales from S to S E.

11. Grey cloudy weather, with ſmall Gales N E. ☿ $29\frac{17}{20}$. In the afternoon ſome Rain.

12. Fair and pleaſant weather, ſomewhat cloudy, with ſmall Northerly Gales. ☿ $29\frac{18}{20}$.

13, Fair and ſerene weather, with ſmall Gales at S W, ſometimes calm. ☿ above $29\frac{11}{20}$.

14. Fair and ſerene weather, with ſmall Gales variable from W to N E. ☿ 30_{d}. The afternoon ſomewhat overcaſt.

15. Fair and pleſant weather, with ſmall Gales at N E. ☿ $29\frac{1}{20}$. At night calm.

16. Fair and ſerene weather, with ſmall Gales from N E to S E. ☿ falling to $29\frac{17}{20}$. In the evening overcaſt with ſome fog.

17. The morning ſome fog on the Hills, all day fair and ſerene, with ſmall Gales at S E. ☿ $29\frac{18}{20}$. At night calm.

18. The morning ſomewhat cloſe and foggy, all day fair and pleaſant with fine Gales at S E. ☿ 30^{d}.

19. Fair and pleaſant weather, with fine Gales at S E. ☿ 30^{d}.

20. Fair and pleaſant weather, with freſh Gales at S E, the Sky ſomewhat hazy. ☿ $29\frac{18}{20}$.

21. Grey cloudy weather, with freſh Gales at S E. ☿ falling below $29\frac{18}{20}$. At noon ſome ſmall Rain.

22. Cloudy hazy weather, with ſmall drizling Rains and moderate Gales at S E. ☿ below $29\frac{17}{20}$.

23. Cloſe and cloudy weather, with moderate Gales at S E. ☿ $29\frac{16}{20}$.

24. Thick hazy weather, with continual Rain, and freſh Gales from N N E to S E. ☿ falling below $29\frac{12}{20}$.

25. Cloſe and cloudy weather, with moderate gales from E to N E. ☿ $29\frac{13}{20}$.

26. The forenoon thick hazy weather, and the afternoon grey cloudy weather, with ſmall gales at N E. ☿ riſing above $29\frac{14}{20}$.

27. Grey cloudy weather, with moderate gales at S E. ☿ above $29\frac{15}{20}$. Some Rain at night.

28. Grey cloudy weather, with the Wind from S E to S S E, ſometimes ſmall gales, and ſometimes blowing freſh. ☿ $29\frac{15}{20}$. Rain at night.

29. Grey cloudy weather, with fine gales at S E, and drizling Rains. ☿ $29\frac{15}{20}$. At night ſmall gales at N E, ſometimes calm with thick weather.

30. Thick foggy weather, for the moſt part calm, and ſmall drizling Rains. ☿ $29\frac{13}{20}$. At night ſmall gales at S E.

31. Grey cloudy weather, ſomewhat foggy, with ſmall gales at S E. ☿ $29\frac{18}{20}$. At night ſome Rain.

JUNE, 1701.

1. Grey cloudy and foggy weather, with ſome Rain in the forenoon, and ſmall gales at W. ☿ $29\frac{13}{20}$. In the afternoon, riſing to $29\frac{15}{20}$. The Wind veering to N, and the weather clearing up.

2. The forenoon fair and pleaſant weather and calm. ☿ $29\frac{17}{20}$. The afternoon overcaſt, with ſome ſmall Rain, and ſmall gales at S E, ☿ falling below $29\frac{16}{20}$. At night ſome Rain.

3. All this forenoon cloſe thick Rainy weather, with ſmall gales at N E, ☿ falling below $29\frac{13}{20}$. The afternoon dry, cloudy and calm.

4. Fair and pleaſant weather, with fine freſh gales from S E to S S E. ☿ above 29 $\frac{14}{20}$.

5. Fair and ſerene weather, very hot, with ſmall gales from W S W to N W. ☿ above 29 $\frac{15}{20}$.

6. Fair and ſerene weather, with variable gales round the Compaſs. ☿ 29 $\frac{17}{20}$. The afternoon ſomewhat cloudy, and at night calm.

7. The forenoon overcaſt and foggy, with ſmall gales at S E, and ſince noon drizling Rains. ☿ falling to 29 $\frac{14}{20}$. Much Rain in the night blowing in Guſts.

8. Cloſe hazy weather, with drizling Rains all day, and ſmall variable breezes for the moſt part calm. ☿ 29 $\frac{13}{20}$. At night fair.

9. This morning clearing up, with ſome drops of Rain and calm. ☿ riſing to 29 $\frac{16}{20}$. The afternoon overcaſt, and ſome Rain in the evening.

10. Grey cloudy weather, ſomewhat foggy, with ſmall gales at S E, ſometimes calm. ☿ 29 $\frac{18}{20}$. The afternoon and night drizling Rains.

11. This morning cloudy and foggy, with drizling Rains and calm. ☿ below 29 $\frac{18}{20}$. The afternoon cloſe and foggy, with drizling Rains and ſmall gales from E S E to S E. ☿ falling to 29 $\frac{14}{20}$.

12. Cloſe foggy weather, with little Wind at S E, and and ſometimes calm. ☿ 29 $\frac{13}{20}$. The afternoon and all night very much Rain.

13. Cloſe foggy weather, with much Rain in the forenoon, and drizling in the afternoon, with ſmall variable breezes, ſometimes calm. ☿ 29 $\frac{13}{20}$.

14. The morning cloſe and foggy, the forenoon clear'd up, with fair and pleaſant weather, and ſmall breezes at S W. ☿ 29 $\frac{14}{20}$. The afternoon overcaſt, with ſmall gales at S E. In the evening ſome vehement Thunder, with Lightning and much Rain. ☿ below 29 $\frac{14}{20}$.

15. The forenoon cloſe foggy weather, the afternoon grey and cloudy with ſmall gales from S E to N E, ſometimes calm. ☿ below 29 $\frac{14}{20}$.

16. The forenoon cloſe and foggy, with ſome Rain; at noon cleared up with ſmall gales from S E. ☿ above $29\frac{13}{20}$. At night cloudy with ſome Lightning.

17. The morning very hazy and calm, the forenoon clear'd up with ſmall gales at S E. ☿ above $29\frac{14}{20}$. The afternoon overcaſt, with the gale veering to N by E, much Rain, Thunder and Lightning. ☿ as before.

98. Grey cloudy weather in the morning, and clear'd up in the afternoon, with ſmall gales at S E. ☿ $29\frac{16}{20}$. The afternoon overcaſt with freſh gales continuing all night. ☿ as before.

19. This forenoon grey cloudy weather, ſometimes clearing up, with freſh gales at S E. ☿ $29\frac{16}{20}$.

20. Fair and cloudy weather, with moderate gales at S E. ☿ $29\frac{17}{20}$.

21. The forenoon fair and ſomewhat cloudy, the afternoon ſerene and pleaſant, with ſmall gales at S E. ☿ below $29\frac{16}{20}$.

22. The forenoon fair and pleaſant, with fine gales at S E. ☿ below $29\frac{16}{20}$. The afternoon grey and cloudy, with little Wind.

23. Fair and pleaſant weather, with ſmall breezes at S E, for the moſt part calm, with ſome Lightning in the night. ☿ $29\frac{16}{20}$.

24. Fair and pleaſant weather, with ſmall gales at S E, ſometimes calm. ☿ $29\frac{16}{20}$. At night overcaſt and calm with ſome Lightning.

25. Fair and ſerene weather, with ſmall gales at S E in the forenoon. ☿ $29\frac{16}{20}$. the afternoon fine freſh gales from S E to S by E, and blowing very freſh all night.

26. Fair and pleaſant weather, blowing very freſh from S by E to S by W, about noon little Wind. ☿ below $29\frac{16}{20}$. The afternoon moderate gales at S E.

27. Fair and ſerene weather, with moderate gales at S E. ☿ below $29\frac{16}{20}$.

28. Fair and ſerene weather, with moderate gales at S E. ☿ as before.

29. Fair and ſerene weather, with fine gales at S E. ☿ 29 $\frac{14}{20}$. The evening overcaſt and blowing freſh all night.

30. Cloudy weather, ſomewhat hazy, with freſh gales from E S E to N E. ☿ below 29 $\frac{14}{20}$. The afternoon much Rain and blowing hard all night at S E. ☿ 29 $\frac{12}{20}$.

JULY, 1701.

1. Cloudy and hazy weather, with ſome Rain and hard Gales at S E. ☿ 29 $\frac{12}{20}$.

2. The Forenoon fair and ſomewhat Cloudy, the Afternoon ſerene, with fine freſh Gales at S E. ☿ below 29 $\frac{11}{20}$. All night Cloudy.

3. Dry weather, ſomewhat Cloudy, with fine Gales at S E. ☿ 29 $\frac{14}{20}$.

4. Fair and ſerene weather, with fine freſh Gales at S E. ☿ 29 $\frac{14}{20}$. The evening overcaſt.

5. Fair and pleaſant weather, ſomewhat cloudy, with a ſmall ſhower in the forenoon, ſome Thunder and eaſie Gales at S E. ☿ above 29 $\frac{15}{20}$. At night little Wind.

6. Fair and ſerene weather, with ſmall gales at S E. ☿ 29 $\frac{16}{20}$. At night little Wind.

7. Fair and pleaſant weather, ſomewhat cloudy, with fine gales at S E. ☿ 29 $\frac{14}{20}$.

8. The Forenoon overcaſt, with ſome Rain and guſts of Wind at S E; the afternoon fair and pleaſant, with eaſie gales at S E. ☿ above 29 $\frac{13}{20}$. At night ſome ſmall Rain.

9. Fair and pleaſant weather, ſometimes cloudy, with fine gales at S E. ☿ above 29 $\frac{13}{20}$.

10. The morning ſomewhat hazy and cloudy, all day fair and ſerene weather, with eaſie gales at S E. ☿ below 29 $\frac{13}{20}$.

11. Fair and pleaſant weather, with ſmall gales at S E. ☿ below 29 $\frac{12}{20}$. The afternoon overcaſt and little Wind. ☿ falling to 29 $\frac{11}{20}$. Some Thunder and Lightning.

12. The forenoon fair and pleaſant, with ſmall gales at S E. ☿ below 29 $\frac{10}{20}$. The afternoon overcaſt, with ſeveral ſmall ſhowers of Rain and little Wind, all night calm.

13. Fair and pleaſant weather, with ſome clouds and calm. ☿ 29 $\frac{12}{20}$. Towards noon overcaſt, and the Wind in ſmall gales veering to S W. with cloſe Rainy weather, all the afternoon, in the evening dry and cloudy, with ſmall gales at W. ☿ 29 $\frac{14}{20}$.

14. This morning and forenoon cloſe and cloudy weather, with much Rain and ſmall gales at W. ☿ 29 $\frac{14}{20}$. The afternoon dry and cloudy, the Wind and ☿ as before.

15. Fair and pleaſant weather, with ſmall breezes from W to S W, ſometimes calm. ☿ 29 $\frac{16}{20}$.

16. Dry cloudy weather, with ſmall gales at S E. ☿ 29 $\frac{14}{20}$.

17. Fair and pleaſant weather, ſometimes cloudy, with fine freſh gales at S E by S. ☿ above 29 $\frac{14}{20}$.

18. Fair and pleaſant weather, ſometimes overcaſt, with freſh gales at S E. At night blowing very hard. ☿ 29 $\frac{16}{20}$.

19. Fair and pleaſant weather, with ſmall gales at S E. ☿ 29 $\frac{16}{20}$.

20. Fair and ſerene weather, with fine freſh gales in the forenoon, and fine freſh gales in the afternoon. ☿ 29 $\frac{15}{20}$. At night calm.

21. Fair and ſerene weather, with fine gales at S E. ☿ 29 $\frac{15}{20}$.

22. Fair and ſerene weather, with fine gales at S E. ☿ 29 $\frac{15}{20}$. At night ſometimes little Wind, at other times blowing freſh.

24. Fair and ſerene weather, with fine gales at S E. ☿ $29\frac{16}{20}$. Afternoon blowing freſh.

25. Very fair and ſerene weather, with ſmall gales at S E. ☿ $29\frac{17}{20}$. At night ſome Lightning.

26. Grey cloudy weather, with ſmall gales at S E, at night calm and ſome Lightning.

27. Grey cloudy weather, with ſmall gales at N N W in the forenoon, and veering to N E in the afternoon. ☿ $29\frac{14}{20}$. At evening much overcaſt, with Thunder, Lightning and ſome Rain.

28. Fair and pleaſant weather, ſomewhat cloudy, with ſmall variable gales from N W to N E. ☿ $29\frac{15}{20}$.

29. Grey cloudy weather, with ſmall variable gales from N E to S W, ſometimes calm. ☿ $29\frac{15}{20}$. In the evening a ſmall ſhower of Rain, with ſome Thunder and Lightning.

30. Fair and ſerene weather and calm. ☿ $29\frac{17}{20}$. In the afternoon ſmall gales at N N W, very hot and ſultry. At night little Wind, with ſome Thunder and Lightning.

31. Fair and pleaſant weather, ſometimes cloudy, with fine gales at S E. ☿ $29\frac{16}{20}$. Some Thunder and Lightning in the afternoon.

AUGUST, 1701.

1. The morning ſomewhat overcaſt, all day fair and pleaſant, with ſmall gales at S E. ☿ $29\frac{16}{20}$. The afternoon fine gales.

2. Very fair and ſerene weather, with fine gales at S E. ☿ $29\frac{17}{20}$.

3. Fair and ſerene weather, with fine gales at S E. ☿ $29\frac{18}{20}$.

4. Fair and ſerene weather, with fine gales at S E. ☿ $29\frac{18}{20}$.

5. The forenoon grey cloudy weather and calm, the afternoon ſerene with ſmall gales at S E by E. ☿ $29\frac{18}{20}$.

6. Fair and ſerene weather, with ſmall gales at N N W. ☿ $29\frac{16}{20}$. The evening overcaſt with ſome Lightning.

7. Fair weather, ſometimes overcaſt, with freſh gales from S to S S E. ☿ $29\frac{17}{20}$.

8. Fair and pleaſant weather in the forenoon, and cloudy in the afternoon, with ſmall Gales at S S E. ☿ $29\frac{16}{20}$.

9. Fair and ſerene weather, with ſmall gales in the forenoon, and freſhning in the afternoon at S E. ☿ $29\frac{19}{20}$.

10. Fair and ſerene weather, with ſmall gales from S E to E by S. ☿ $29\frac{18}{20}$. At night calm.

11. Fair and ſerene weather, calm in the forenoon, and ſmall variable gales in the afternoon, and Lightning at night. ☿ $29\frac{18}{20}$.

12. Fair and ſerene weather, with ſmall gales at S S E, at night calm and hazy. ☿ $29\frac{17}{20}$.

13. Fair and ſerene weather, calm in the forenoon, and ſmall variable breezes in the afternoon. ☿ $29\frac{18}{20}$.

14. Fair weather, ſometimes overcaſt, with ſmall gales at N W by W. ☿ $29\frac{15}{20}$.

15. Fair weather, ſomewhat cloſe, and ſome Rain in the afternoon, with ſmall variable gales. ☿ $29\frac{15}{20}$.

16. Fair and ſerene weather, calm in the forenoon, and ſmall variable breezes in the afternoon. ☿ $29\frac{15}{20}$.

17. The weather cloudy and overcaſt, with ſome Rain in the afternoon, and ſmall variable gales round the Compaſs. ☿ $29\frac{16}{20}$.

18. Grey cloudy weather, with ſome Rain, and eaſy gales at N E. ☿ $29\frac{16}{20}$. In the night very freſh gales from N E to S E, and ſometimes at N W.

19. Grey cloudy weather, with ſome Rain, and freſh gales from S E to E S E. ☿ $29\frac{15}{20}$.

20. Fair and pleaſant weather, with fine gales at S E. ☿ 29 $\frac{16}{20}$.

21. Fair and pleaſant weather, with fine gales at S E. ☿ 29 $\frac{16}{21}$.

22. Fair and ſerene weather, with ſmall gales at S E. ☿ 29 $\frac{18}{20}$.

23. Fair and pleaſant weather, with ſmall gales at S E, in the afternoon ſomewhat cloudy and the gale freſhning. ☿ 29 $\frac{18}{20}$. In the night blew very freſh.

24. Fair and ſerene weather, with moderate gales at S E. In the evening much overcaſt, and at night much Rain with ſome Thunder and Lightning. The Wind at N W. ☿ 29 $\frac{15}{20}$.

25. The morning grey and cloudy, all day fair and pleaſant, with ſmall gales at N W, in the afternoon veering to S E, and at night calm. ☿ 29 $\frac{16}{20}$.

26. Fair and pleaſant weather, with ſmall gales at S E. ☿ 29 $\frac{16}{20}$.

27. Grey cloudy weather, with drizling Rains this morning and forenoon ; and fair in the afternoon, with ſmall variable gales. ☿ 29 $\frac{15}{20}$.

28. Fair and pleaſant weather, with ſmall gales from N to N E. ☿ 29 $\frac{17}{20}$. At night calm.

29. Fair pleaſant weather, with ſmall gales at N E. ☿ 29 $\frac{17}{20}$. At night ſome drizling Rain.

30. Fair and pleaſant weather, ſomewhat cloudy, with eaſie gales at N E. ☿ 29 $\frac{16}{20}$.

31. Grey cloudy weather, with ſome Rain, and moderate gales at N E, in the night blowing in guſts. ☿ 29 $\frac{14}{20}$.

SEPTEMBER, 1701.

1. Fair weather, ſometimes overcaſt, with freſh gales from N to N N W. ☿ 29 $\frac{14}{20}$.

2. Cloudy weather, with ſome Rain, and bluſtering gales at N N W. ☿ $29\frac{15}{20}$.

3. Fair and pleaſant weather, with moderate gales at N N W, ſometimes overcaſt and blowing freſh; at night little Wind. ☿ $29\frac{16}{20}$.

4. Fair and pleaſant weather, with ſmall gales from N W to N. At night calm. ☿ $29\frac{18}{20}$.

5. Fair and pleaſant weather, with ſmall gales at N. ☿ $29\frac{18}{20}$.

6. Fair and pleaſant weather, with ſmall gales at N and N by W. ☿ $29\frac{18}{20}$.

7. Fair and pleaſant weather, with ſmall gales at N by W and N N W. ☿ below $29\frac{18}{20}$.

8. Fair and pleaſant weather, with ſmall gales at N N W. ☿ below $29\frac{18}{20}$.

9. Fair and ſerene weather, with ſmall gales at N. ☿ $29\frac{18}{20}$.

10. Fair and ſerene weather, with ſmall gales at N. ☿ $29\frac{18}{20}$.

11. Fair and ſerene weather, with ſmall gales at S E, and at night veering to E N E. ☿ $29\frac{18}{20}$.

12. Fair and ſerene weather, with ſmall gales at S S E. ☿ $29\frac{18}{20}$.

13. The forenoon fair and pleaſant, the afternoon grey cloudy weather, with ſmall gales at E S E. ☿ 30 d.

14. Grey cloudy weather, with ſmall gales from E S E to E N E, ſometimes calm. ☿ 30 d. In the night, variable gales with ſome Rain.

15. Grey cloudy weather, with ſmall gales from N E to S E by E. ☿ 30 d.

16. The morning cloudy and overcaſt, all day clear'd up, with eaſie gales at S E. ☿ 30 d.

17. Fair and ſerene weather, with moderate gales at S E. ☿ 30 d.

18. Fair and ſerene weather, with moderate gales at S E. ☿ 30 d.

19. Fair and ſerene weather, with ſmall gales at S E. ☿ 29 $\frac{18}{20}$.

20. Cloſe hazy weather, with ſmall gales from N E. ☿ 30 $\frac{1}{20}$. In the afternoon ſome Rain.

21. Grey cloudy weather, with moderate gales at N by E and N N E. ☿ 30 $\frac{3}{20}$. In the evening little Wind.

22. Dry temperate weather,ſomewhat grey and cloudy, with ſmall gales at N by W. ☿ 30 $\frac{5}{20}$.

23. Fair and pleaſant weather, ſomewhat cloudy, with ſmall Gales at N N W. ☿ 30 $\frac{4}{20}$.

24. Fair and pleaſant weather, with ſmall gales at N N W. ☿ 30 $\frac{2}{20}$.

25. Fair and pleaſant weather, with ſmall gales at N N W. ☿ 30 $\frac{1}{20}$.

26. Fair weather, ſomewhat cloudy, in the afternoon ſome ſhowers of Rain, and ſmall gales from N N W to N W by W. ☿ 30 $\frac{2}{20}$, riſing at night to 30 $\frac{4}{20}$.

27. Fair and cloudy weather, with ſmall gales from N N W to N. ☿ 30 $\frac{4}{20}$.

28. Fair and pleaſant weather, with ſmall gales from N by W to N by E.

29. Dry and cloudy weather, with ſmall gales at N N W.

30. Fair and pleaſant weather in the forenoon, with ſmall gales at N N E, the afternoon overcaſt with guſts of Wind and ſome ſhowers of Rain.

OCTOBER, 1701.

1. The morning overcaſt, all day fair and pleaſant, with ſmall gales from N N E to N.

2. The morning grey and cloudy, all day fair and pleaſant, with ſmall gales at N by W.

3. Grey cloudy weather, with moderate gales at N and N by E, ſometimes blowing freſh; at night thick and hazy with ſome Rain.

4. Thick hazy weather, towards noon clear'd up, afternoon overcaſt with Rain and dark weather. Small gales at N N E.

5. Grey cloudy weather, with ſmall Gales at N N E, inclining to Rain.

6. Thick hazy weather, with much Rain and ſmall gales at N N E. ☿ below 30 d.

7. The morning cloſe and cloudy weather, with ſome Rain, and ſmall gales at N and N by W. ☿ below 30 d. All day thick hazy weather, with drizling Rains.

8. Hazy weather, with drizling Rains and ſmall gales at N N E and N E. ☿ $30\frac{3}{20}$.

9. Cloſe hazy weather, with drizling Rains, and ſmall gales at N E. $30\frac{4}{20}$. ☿ At night $30\frac{5}{20}$.

10. Cloſe and cloudy weather, with ſome Rain, and moderate gales at N E. $30\frac{5}{20}$.

11. Grey cloudy weather, with ſome Rain at night and ſmall gales at N N E. ☿ $30\frac{6}{20}$.

12. The morning ſerene, with ſmall gales at N E, ☿ $30\frac{7}{20}$. The afternoon grey cloudy weather. ☿ $30\frac{6}{20}$.

13. Dry cloudy weather, with ſmall gales at N by E. ☿ $30\frac{6}{20}$. The afternoon more ſerene and almoſt calm.

14. Grey cloudy weather, with moderate gales at N E, ſometimes blowing freſh. ☿ $30\frac{2}{20}$.

15. Grey cloudy weather inclining to Rain, with moderate gales at N by W. ☿ $30\frac{2}{20}$. At night much Rain.

16. Grey cloudy weather, with ſome Rain at night, and freſh gales at N and N by W. ☿ $30\frac{4}{20}$.

17. Grey cloudy weather, with moderate gales at N by E, blowing freſh in the night at N N W. ☿ $30\frac{4}{20}$.

18. Fair and pleaſant weather, with moderate gales at at N W by N. ☿ $30\frac{5}{20}$.

19. Fair and ſerene weather, with ſmall gales at N W. ☿ $30\frac{6}{20}$.

20. Fair and ſerene weather, with ſmall gales at W N W and W by N. ☿ $30\frac{6}{20}$.

21. Fair and ſerene weather, with ſmall gales at N E and N E by E. ☿ $30\frac{6}{20}$.

22. Fair and ſerene weather, with ſmall gales at N and N by E. ☿ $30\frac{6}{20}$.

23. Fair and ſerene weather, with ſmall Northerly breezes, ſometimes calm. ☿ $30\frac{5}{20}$.

24. A grey cloudy morning, blowing freſh at N N W. All day fair and pleaſant, with moderate gales at N. ☿ $30\frac{5}{30}$.

25. The forenoon overcaſt with fine freſh gales at W N W, and ſharp weather, the afternoon more ſerene and ſmaller gales. ☿ $30\frac{7}{20}$.

26. Fair ſerene weather, with fine ſharp gales at N N W. ☿ $30\frac{8}{20}$.

27. Fair and ſerene weather, with ſmall gales at E S E and S E, ſometimes calm. ☿ $30\frac{6}{20}$.

28. Grey cloudy weather, with freſh gales at N N W and N. ☿ $30\frac{8}{20}$.

29. Fair weather, ſomewhat cloudy with moderate gales from N by W to N W. ☿ $30\frac{8}{20}$.

30. Grey cloudy weather, with moderate gales at N W. ☿ $30\frac{8}{20}$.

31. Fair and ſerene weather, with moderate gales at N by W and N. ☿ $30\frac{10}{20}$. Very cold.

NOVEMBER, 1701.

1. Fair and ſerene weather, with ſmall gales at W N W. ☿ $30\frac{6}{20}$.

2. Grey cloudy weather, with ſome Rain in the evening, and moderate gales at N N W. ☿ $30\frac{5}{20}$.

3. Fair and ſerene weather, ſomewhat hazy with very freſh gales at N by W and N N W. ☿ below $30\frac{6}{20}$.

4. Fair and ſerene weather, with ſmall Breezes at N by E. ☿ $30\frac{6}{20}$. At night calm.

5. Fair and ſerene weather, with ſmall breezes at S E. Sometimes calm. ☿ $30\frac{6}{20}$.

6. Fair and ſerene weather, with ſmall breezes from W S W to W N W. ☿ $30\frac{5}{20}$.

7. Fair and ſerene weather, with ſmall gales at N W. ☿ $30\frac{6}{20}$.

8. This morning foggy; all day ſerene, with moderate gales from S W to N W. ☿ $30\frac{6}{20}$.

9. Fair and pleaſant weather, ſometimes overcaſt, with moderate gales at S E and E S E. ☿ $30\frac{4}{20}$. At night little Wind and calm.

10. Fair and ſerene weather, with moderate gales at S E. ☿ $30\frac{5}{20}$.

11. Grey cloudy weather, with ſmall gales at N and N by W. In the evening calm. ☿ $30\frac{2}{20}$.

12. Fair and pleaſant weather, with ſmall gales at N. In the evening calm. ☿ $30\frac{4}{20}$

13. Fair and pleaſant weather, with ſmall gales from S by E to S E. ☿ $30\frac{4}{20}$. At night calm.

14. Grey and cloudy weather ſomewhat hazy, with moderate gales from W N W to N W. ☿ $30\frac{5}{20}$.

15. Grey cloudy weather, with freſh gales at N N E, and ſome ſmall Rain. $30\frac{5}{20}$.

16. Fair and pleaſant weather, with moderate gales from S to S E. ☿ $30\frac{6}{20}$.

17. Grey cloudy weather, with moderate gales from S by W to E S E. ☿ $30\frac{5}{20}$. At night blowing hard and veering to N W, with much Rain.

18. Grey cloudy weather, with freſh gales at N W. In the afternoon blowing very hard. ☿ 30 d.

19. Grey cloudy weather, with moderate gales at N W. ☿ $30\frac{6}{20}$. At night riſing to $30\frac{10}{20}$.

20. Fair and pleaſant weather, with ſmall gales from N to F, and about to S E. In the evening little Wind. ☿ $30\frac{10}{20}$, falling to $30\frac{6}{20}$.

21. Grey cloudy weather, for the moſt part calm, with ſmall Northerly breezes. ☿ $30\frac{6}{20}$.

22. Grey cloudy weather, with moderate gales at N W. ☿ $30\frac{6}{20}$.

23. Grey cloudy weather, with fine gales at N W. ☿ $30\frac{6}{20}$.

24. Grey cloudy weather, with eaſie gales from W N W to N W. ☿ $30\frac{8}{20}$.

25. Grey and cloudy weather, with eaſie gales at N W. ☿ $30\frac{6}{20}$.

26. Fair and ſerene weather, with ſmall gales at N W, ſometimes calm. ☿ $30\frac{6}{20}$.

27. Thick hazy weather, with drizling Rains, and at night much Rain, with ſmall Southerly breezes, for the moſt part calm. ☿ $30\frac{2}{20}$.

28. Hazy weather, with drizling Rains all day and night, and ſmall gales from N to N N E. ☿ $30\frac{1}{20}$, riſing to $30\frac{3}{20}$.

29. Grey cloudy weather, with ſmall gales at N N E. ☿ $30\frac{5}{20}$.

30. Grey cloudy weather, with fine gales at N. ☿ $30\frac{8}{20}$.

DECEMBER, 1701.

1. Grey cloudy weather, and very cold with fine gales at N. ☿ $30\frac{12}{20}$. Some froſt at night.

2. Dry weather, ſomewhat cloudy, with moderate Gales at N N W. ☿ $30\frac{8}{20}$.

3. Fair and ſerene weather, with ſmall Gales at N W. ☿ $30\frac{6}{20}$.

4. Fair and ſerene weather, with ſmall Gales at N W and W N W. ☿ $30\frac{6}{20}$. At night overcaſt.

5. Dry cloudy weather, with moderate gales at N by W. ☿ $30\frac{9}{20}$.

6. Fair and plaaſant weather, with fine gales from E to S E, and at night calm. ☿ $30\frac{7}{20}$, falling to $30\frac{5}{20}$.

7. Grey cloudy weather, with freſh gales at N W and W N W. ☿ $30\frac{8}{20}$.

8. Fair weather, ſomewhat cloudy, with freſh gales at N W. ☿ $30\frac{12}{20}$.

9. Fair and pleaſant weather, with fine gales at N N W. ☿ $30\frac{11}{20}$.

10. Fair and ſerene weather, with ſmall gales at N W to N. ☿ $30\frac{11}{20}$. At night calm.

11. Fair and ſerene weather, with ſmall gales at N W. ☿ $30\frac{1}{20}$.

12. Fair and ſerene weather, ſometimes cloudy, with ſmall gales at N W. ☿ $30\frac{9}{20}$.

13. Fair and ſerene weather, with ſmall gales at N W. ☿ $30\frac{7}{20}$. At night calm.

14. Fair and ſerene weather, with ſmall gales at N W. ☿ $30\frac{6}{20}$. At night calm.

15. Fair and ſerene weather, with ſmall gales at S S W. ☿ $30\frac{8}{20}$. At night the gale freſhned from S S E.

16. Grey cloudy weather, with moderate gales at S E. ☿ $30\frac{6}{20}$. At night ſome Rain.

17. Grey cloudy weather, with drizling Rains, and ſmall gales at N W. ☿ $30\frac{5}{20}$. At night calm.

18. Grey cloudy weather, with moderate gales at N W. ☿ $30\frac{6}{20}$. Some ſlite in the night.

19. Grey cloudy weather, with moderate gales at N W. ☿ $30\frac{5}{20}$.

20. Fair and ſerene weather, with ſmall gales at N W. ☿ $30\frac{5}{20}$. At night $30\frac{4}{20}$.

21. The forenoon ſomewhat hazy and calm. ☿ $30\frac{5}{20}$. The aftetnoon ſerene, with ſmall gales at N W. ☿ $30\frac{6}{20}$.

22. Fair and ſerene weather, freezing, with freſh gales at N N W. ☿ 30 $\frac{11}{20}$.

23. Serene weather, freezing hard, with freſh gales at N N W. ☿ 30 $\frac{14}{20}$. At night little Wind.

24. Serene weather, freezing hard, with moderate gales at W N W. ☿ 30 $\frac{11}{20}$.

25. Fair froſty weather, with moderate gales at N W. ☿ 30 $\frac{10}{20}$.

26. Fair froſty weather, with ſmall gales from W N W to N N W. ☿ 30 $\frac{10}{20}$. At night fog.

27. 'Fair and ſerene weather, freezing with little Wind at N W, for the moſt part calm. ☿ 30 $\frac{9}{20}$.

28. Fair and ſerene weather, freezing with ſmall breezes at N, and ſometimes calm. ☿ 30 $\frac{8}{20}$.

29. Fair and ſerene weather, with ſmall Northerly breezes for the moſt part calm. ☿ 30 $\frac{6}{20}$. At night ſome Wind and Rain.

30. The morning foggy, all day fair and pleaſant, with ſmall gales from S E to E by S. ☿ 30 $\frac{4}{20}$.

31. Cloſe and cloudy weather, with drizling Rains, for the moſt part calm. ☿ 30 $\frac{2}{20}$.

JANUARY, 1702.

1. Thick hazy weather, with drizling Rains, for the moſt part calm, with ſmall variable breezes. ☿ 30 $\frac{2}{20}$.

2. Grey cloudy weather, with ſome Rain, and ſmall gales at N E. ☿ 30 $\frac{4}{20}$.

3. Grey cloudy weather, with ſmall gales at N and N N W. ☿ 30 $\frac{8}{20}$.

4. Grey cloudy weather, with ſmall Northerly gales. ☿ 30 $\frac{9}{20}$.

5. Grey cloudy weather, with ſmall Northerly gales. ☿ 30 $\frac{6}{20}$. Afternoon and night ſerene.

6. Fair and pleaſant weather, with moderate gales at S E. In the evening and all night calm. ☿ $30\frac{2}{20}$.

7. Cloſe and hazy weather, with ſmall gales at E S E and S E, ſometimes calm. ☿ $30\frac{2}{20}$.

8. Cloſe and cloudy, in the morning little Wind, towards noon blowing ſomewhat freſh at N N W, and in the evening moderate. ☿ $30\frac{2}{20}$, riſing to $30\frac{6}{20}$.

9. Grey cloudy weather, with ſmall Northerly gales. ☿ $30\frac{4}{20}$.

10. Grey cloudy weather, with ſmall variable gales, ſometimes calm. ☿ $30\frac{4}{20}$. ☿ $30\frac{4}{20}$.

11. Fair and ſerene weather, with ſmall breezes at S E. ☿ $30\frac{5}{20}$.

12. The weather overcaſt, with moderate gales at W N W. ☿ $30\frac{6}{20}$.

13. Fair and pleaſant weather, with moderate gales at N W. ☿ $30\frac{10}{20}$.

14. Fair and ſerene weather, with ſmall gales at N. ☿ $30\frac{10}{20}$.

15. Fair and ſerene weather, with ſmall gales at S E. ☿ $30\frac{8}{20}$.

16. Grey cloudy weather, with ſmall gales from S S W to S E. The afternoon cloſe and hazy, with ſome Rain. ☿ $30\frac{2}{20}$.

17. Cloſe hazy weather, with moderate gales from N W to N by W, ☿ $30\frac{2}{20}$. At night little Wind. *The* Chineſe *New Year begun this day.*

18. Cloſe and cloudy weather and calm. ☿ $30\frac{2}{20}$. The afternoon ſmall drizling Rains.

19. Grey cloudy weather, with freſh gales at N by W, and a little Snow. ☿ $30\frac{6}{20}$.

20. Grey cloudy weather, with ſmall Gales at N W, the afternoon ſerene, and freezing hard at night. ☿ $30\frac{6}{20}$.

21. Fair and ſerene weather, freezing, with ſmall gales at N N W, for the moſt part calm. ☿ above 30 $\frac{6}{20}$.

22. Fair ſerene weather, freezing hard, with ſmall Northerly breezes, for the moſt part calm. ☿ 30 $\frac{8}{20}$.

23. Grey cloudy weather and calm. ☿ 30 $\frac{6}{20}$.

24. Cloſe hazy weather, with drizling Rains and calm. ☿ 30 $\frac{7}{20}$.

25. Grey cloudy weather, with ſmall gales at N E. ☿ 30 $\frac{6}{20}$. At night little Wind and ſome Rain.

26. Cloſe and cloudy weather, with ſmall gales at N E. ☿ 30 $\frac{8}{20}$. At night calm. ☿ 30 $\frac{2}{20}$.

27. Thick hazy weather, with drizling Rains and ſmall gales at N by E. ☿ 30 $\frac{1}{20}$, blowing freſh at night.

28. Grey cloudy weather, with freſh gales at N N W. ☿ 30 $\frac{6}{20}$. At night 30 $\frac{8}{20}$.

29. Grey cloudy weather, with fine gales at N W. ☿ 30 $\frac{8}{20}$.

30. Fair and pleaſant weather, with moderate gales at N W. ☿ 30 $\frac{7}{20}$.

31. Fair and ſerene weather, with ſmall gales at N W. ☿ 30 $\frac{6}{20}$.

VI. *An*

VI. *An Account of a Book.* Lexicon Technicum: *Or, an Univerſal* Engliſh *Dictionary of Arts and Sciences, explaining not only the Terms of Art, but the Arts themſelves. In Folio. By* J. Harris, *M. A. and F. R. S.*

THE deſign of this Dictionary is different from that of moſt others; for here are explained not only the Terms which are uſed in every Art and Science, but likewiſe the Arts and Sciences themſelves; in moſt of which the Reader will find ſomething that is new, and all things deliver'd in a clear and regular method.

The Author hath been very full and particular in all the parts of the Mathematicks.

In *Geometry*, under the name of each Figure he demonſtrates its eſſential Properties, and ſhews its conſtruction and uſe.

Under ſuch words as *Parabola*, *Ellipſis*, *Hyperbola*, the Author is very large, and not only defines thoſe Figures, but demonſtrates their moſt remarkable and Primary Properties; as likewiſe thoſe of the *Conchoid*, *Cycloid*, *Logarithmick Line*, *Ciſſoid*, *Quadratrix*, and Spiral Lines; and is very full in the uſeful arts of Trigonometry, both Plain and Spherical, with their uſes and applications; in Spherical Geometry, or the Art of projecting the Sphere *in plano*, in Surveying, Dyalling, *&c.* in all which he has not ſo ſtrictly confin'd himſelf to other Authors, but that the Reader may meet with ſomething that is new.

Under *Algebra* and the Terms thereunto belonging (ſuch as Equation, Conſtruction, *&c.*) he hath given a clear and diſtinct account of the nature of that Science; giving all the Rules, together with their Reaſons and Demonſtrations, the Reſolution of Adfected Equations, the Conſtructions of Cubicks and Biquadraticks, with the Inveſtigation of Mr *Baker*'s Central Rule, *&c.*

Under the word *Aſſymptote* he hath ſeveral conſiderations concerning Aſſymptotical Curves, where he ſhows that Curves which admit of no Rectilineal Aſſymptot may notwithſtanding be aſſymptomatical to one another, with ſeveral other conſiderations of the like nature. Nor has he been leſs full in what we call the new Methods; under the word *Fluxions* he has given us the firſt Principles of that Science, *viz.* the nature and *Algorithm* of them; and their uſe and application he has every where given under proper heads, and by theſe is ſhown an univerſal Method of drawing of *Tangents* to all Curves, of determining the Points of *Inflexion* and *Retrogreſſion*: of reſolving queſtions *de Maximis & Minimis*; of finding the Centres of *Gravity*, Oſcillation, *&c.*

All the parts of *Arithmetick* are here explained, with its application to *Anatociſm*, *compound Intereſt*, and *Annuities*, together with the doctrine of *Surds*, the Method of Extracting *Roots* by *converging Series*, Logarithms, and Fractions, both Vulgar, Decimal, and Sexageſimal.

He hath likewiſe given the Deſcription and Uſe of both the *Celeſtial* and *Terreſtrial Globe*, the different Hypotheſes of Aſtronomers, with an explication of the Terms belonging to each; the *Parallaxes*, *Magnitudes*, *Motions*, and *Diſtances* of the *Planets*; with ſeveral curious Obſervations relating to the Heavenly Bodies, Mr *Newton*'s Theory of the Moon, with a large account of *Comets*, from the ſame Author; the Nature and Uſe of Opticks, Catoptricks, Dioptricks, with ſeveral Methods for finding the *Foci* of Spherical Glaſſes, the doctrine of the *Acceleration* of Heavy Bodies; the compoſition of Motion, Geography, Muſick, *&c.*

In *Anatomy* he has been very particular, giving a large account of all the Parts of a Humane Body, both Internal an External, with the deſcriptions of the Muſcles and Bones, in a fair Plate, and under ſuch general words as *Blood*, *Circulation*, *Heart*, *Ear*, *Eye*, *Arteries*, *Veins*, *Bile*, *Lympha*, *Chylification*, &c. he hath always conſulted the beſt Authors.

In *Architecture* likewiſe he hath in a Plate given an explanation of the Five Orders of Pillars, together with a full and clear account of the Nature and Rules of that Art, which is to be met with under the ſeveral terms thereunto belonging.

In *Fortification*, beſides an explication of the whole Art under proper terms from the beſt Authors in that kind, he hath alſo a new Plate with a deſcription annexed, wherein all the parts of a Fortify'd place are clearly ſeen at one view.

He hath deſcribed the ſeveral parts of a *Ship*, both as in the Dock when Building, and when Rigged and under ſail at Sea: Wherein he has been very accurate and particular; for beſides the helps of the beſt Dictionaries in that kind, as well as *Draughts*, *Sections* and *Models*, he has often gone aboard himſelf to get a more ready and ſure knowledge in this matter.

He hath given the *Laws* of *Motion*, both with reſpect to uniform and accelerated Motions, he hath determin'd the Laws of the ſhock of Bodies perfectly *hard*, and thoſe that are *Elaſtick*, &c.

In *Gunnery* he hath given demonſtrative rules and methods for ſhooting in Great Guns and Mortars, from the Theorems of the Learn'd Captain *Halley*, and from Mr *Anderſon*'s Tables.

He hath given us alſo the Doctrine of *Mechanicks* and *Staticks*, hath determin'd the Laws of Projectiles, and is very large in *Hydroſtaticks*, giving an account of the nature and properties of Fluids, determining them both Experimentally and Mathematically, and has annexed a very accurate Table of the Specifick gravities of different Bodies, from Mr *Boyle*, Mr *Collins*, and his own Experiments.

The Grand *Phænomena* of *Nature* he hath explain'd from the beſt Authors, as the Law of Gravitation from Mr *Newton*, the Theory of the Tides from Captain *Halley* on his Principles, *&c.* And under ſuch general Terms as *Magnetiſm*, *Light*, *Colours*, *Elaſticity*, *Solidity*, *Diviſibility*, *Volatility*, *Firmneſs*, *Heat*, *Cold*, *Wind*, &c. you have what is diſcovered concerning the nature and properties of thoſe qualities from Experiments and Obſervation.

The *Phænomena* of the *Rainbow* or *Iris*, he hath accounted for from the Learned and Ingenious Captain *Halley*.

He hath given an account of *Snow* from Dr *Grew*, and one of *Ice* from the *French*.

As to *Sound* he hath collected all he cou'd meet with, but withal hints, that that quality is not ſufficiently underſtood, and wiſhes it were a little better conſidered.

He is very full in his Explication of the Phœnomena and Properties of the *Air* and *Atmoſphere*, as its *Gravity*, *Spring* or *Elaſtici-*

ty, *&c.* and likewiſe in its deſcriptions of the uſe of ſuch Inſtruments as have been invented, to enable us to judge of them, as the Barometer, Thermometer, Hygrometer, *&c.* moſt of which is from the Honourable Mr *Boyle* and the Philoſophical Tranſ.

He hath given an account of *Springs* and *Fountains* from Capt. *Halley* and Dr *Woodward.*

In the Art of *Botany* he hath been very large, giving an account of the ſeveral kinds of *ſubalternate* Species of Plants, and their Specifick differences, in which he chiefly follows our excellent Botaniſt Mr *Ray*, but hath conſulted Mr *Tournefort*, alſo *Moriſon* and other Writers on this ſubject.

He hath explain'd the method of calculating of *Automata* or *Clock* and *Watch-work* from Mr *Derham*, as alſo the terms of Art uſed in Painting and Sculpture.

He has given a Table of Foſſils from the Learn'd Dr *Woodward*; a Scheme of Metals and Stones from Bp *Wilkins* real Character; and a Table of Animals from Mr *Ray*.

He has alſo given from Dr *Woodward* a very large account of Vegetation confirm'd by very accurate Experiments and Obſervations, from all which that matter is ſet in a better light than it has ever yet appeared in.

In *Chymiſtry* he hath been very large and particular, explaining the *Chymical Principles*, *Veſſels* and degrees of *Fire*, and hath omitted no proceſs or Operation of uſe, that he could either meet with in Books, procure from his Friends, or had an opportunity of trying himſelf.

In *Heraldry* he hath given the entire Art of Blazoning and Marſhalling a Coat of Arms; and explained all the *Ordinarys*, *Charges*, *Bearings*, &c. by Figures, but hath ſaid nothing of Families (any further than that ſuch a Coat belongs to ſuch a Name) explaining only the Art and its terms.

In *Logick*, *Metaphyſicks*, *Ethicks*, *Grammar*, *Rhetorick*, *&c.* he is deſignedly very ſhort; giving uſually the bare explication of the Words and terms of thoſe Arts.

In *Hiſtory* and *Chronology* he hath given what properly belongs to them as Arts, as an account of the *Civil* computation of time, the original and reduction one to another of the ſeveral Æra's, Epocha's, Periods, *&c.*

As to the *Law*, he has conſulted the beſt Authors and Dictionaries in that kind he could meet with, and hath from thence tranſcribed abridgedly all that ſeem'd neceſſary, and then had it examin'd and corrected by a Perſon of known Ability in that Profeſſion.

Printed for *Sam. Smith* and *Benj. Walford*, Printers to the Royal Society, at the *Princes Arms* in St *Paul's* Church-yard. 1704.

ADVERTISEMENT.

TAbles of Intereſt for all Rates and Times, newly and exactly computed, by Mr *Iſrael Falgate*, at the Bank of *England.*

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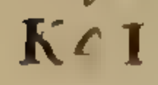

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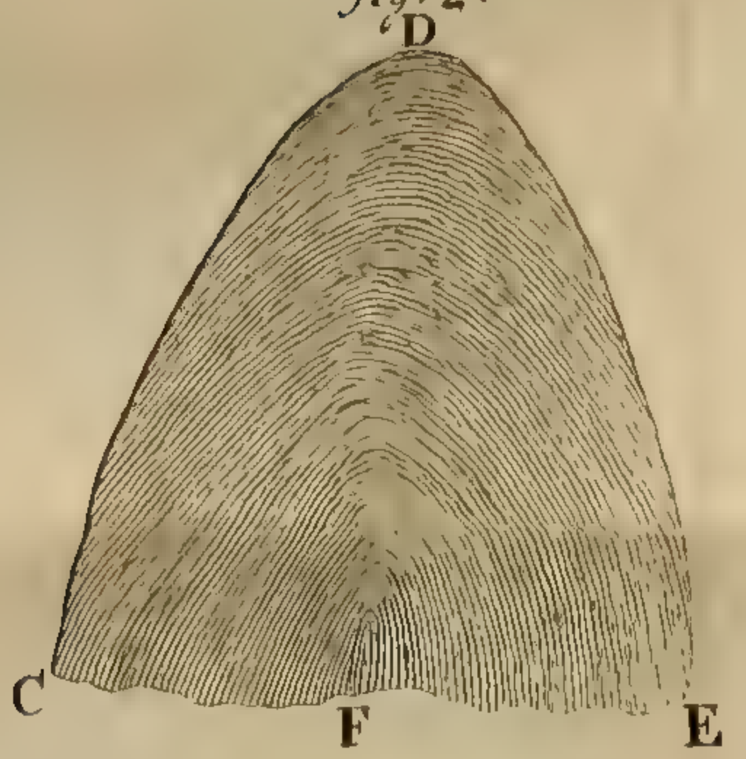

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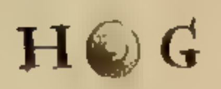

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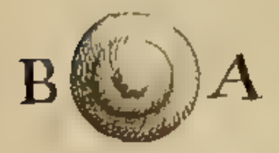

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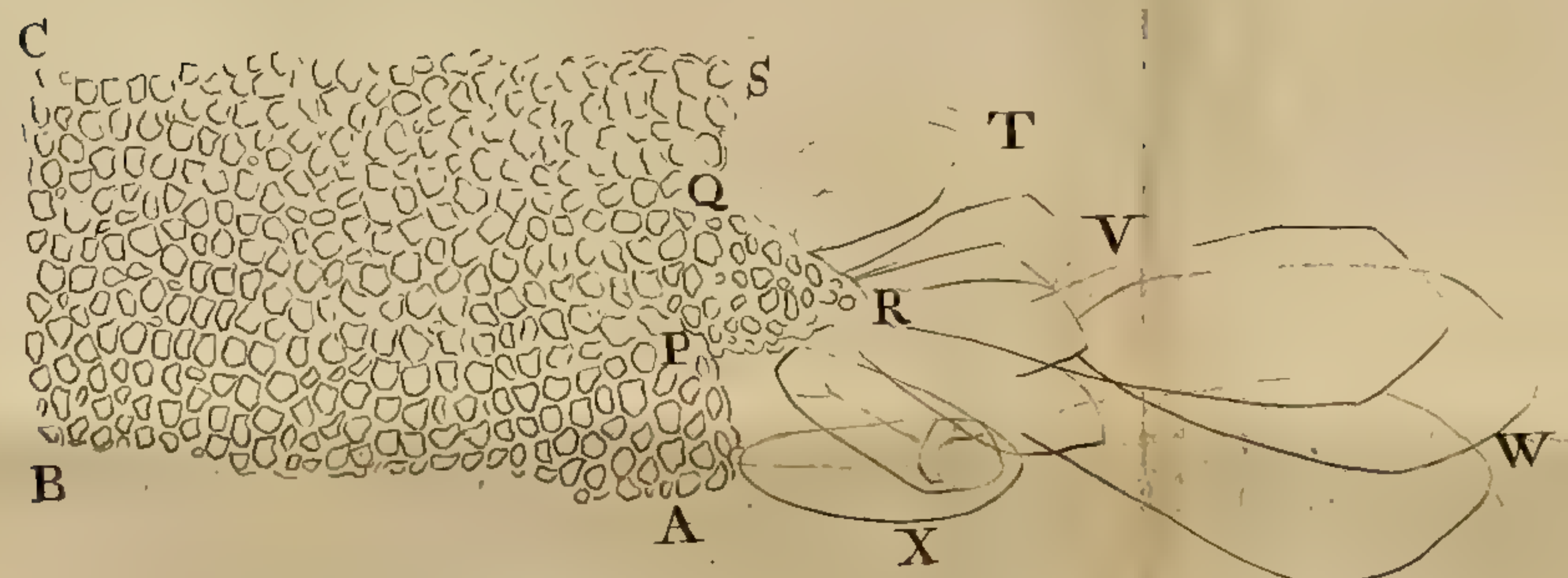

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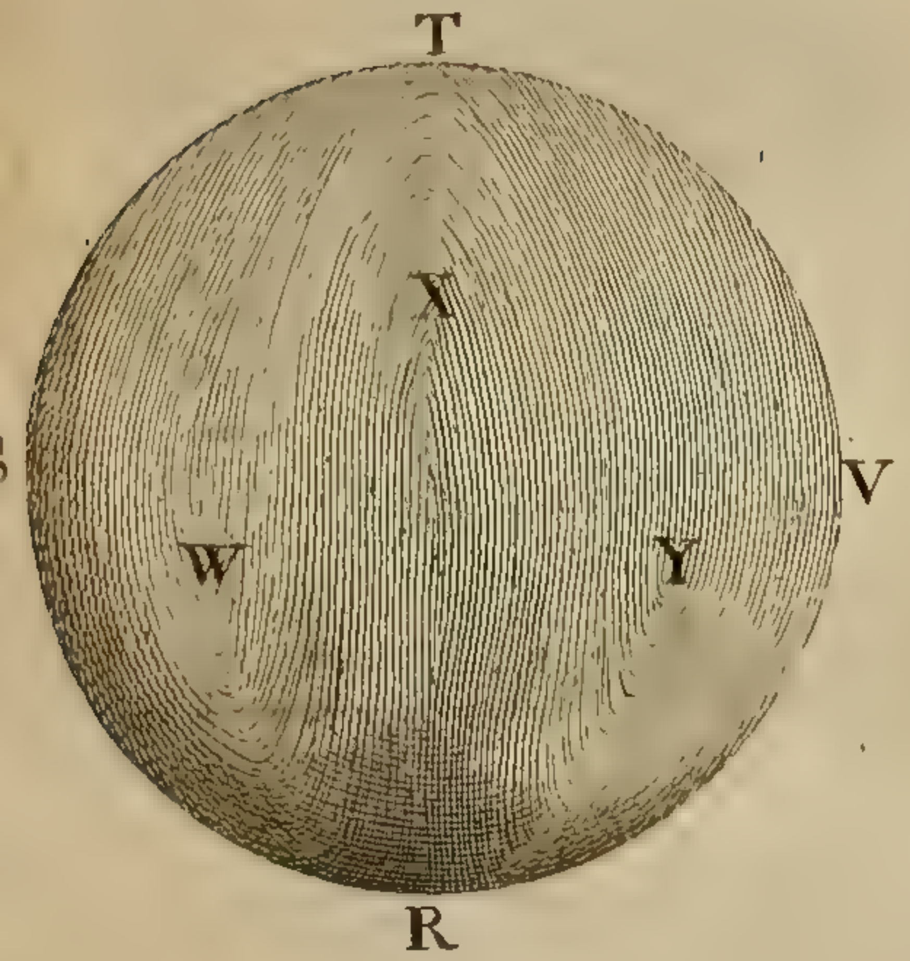

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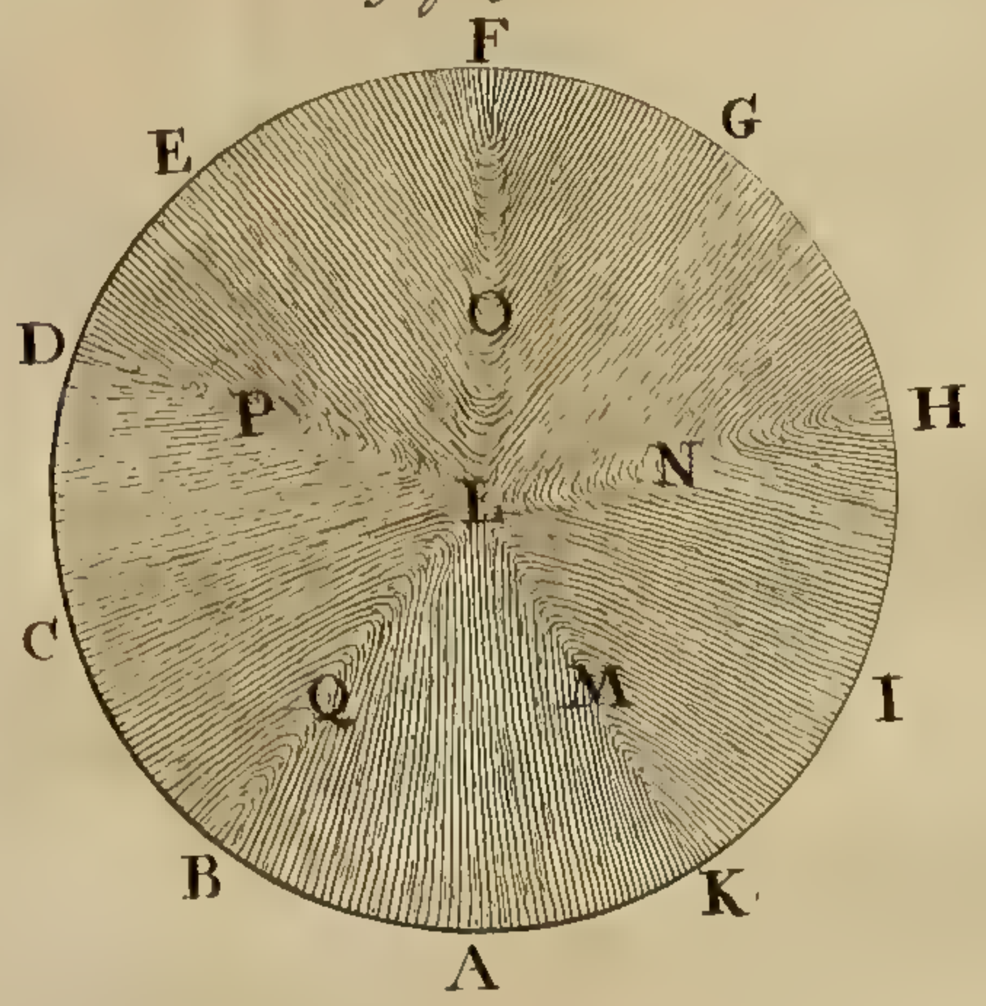

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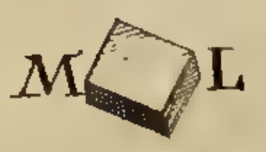

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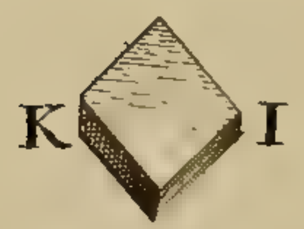

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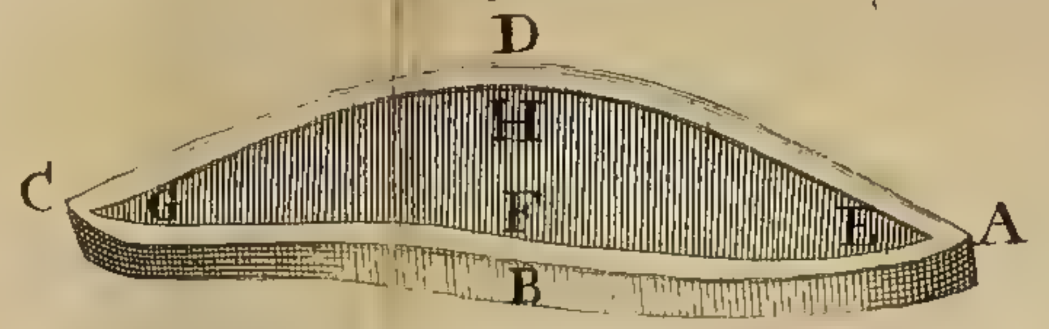

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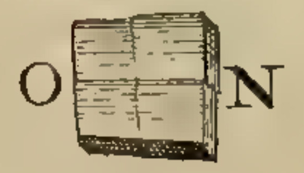

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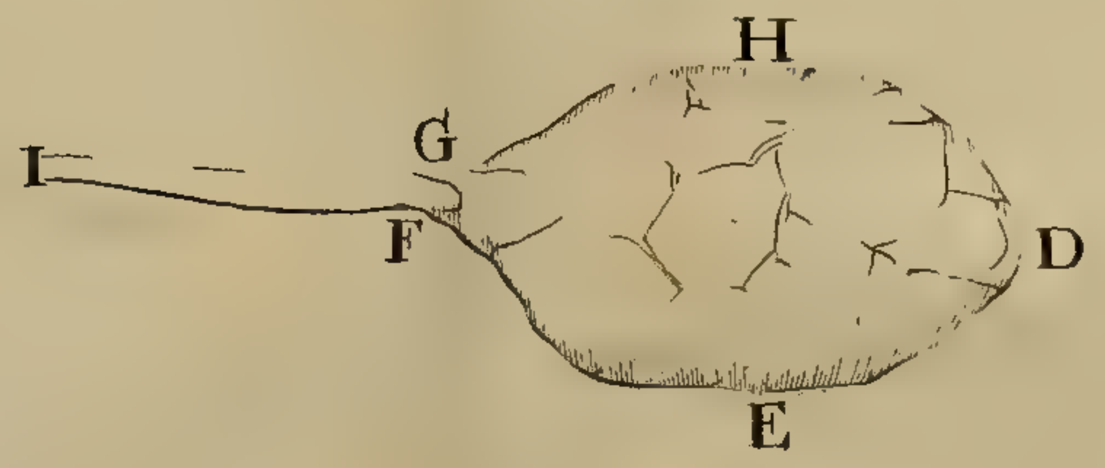

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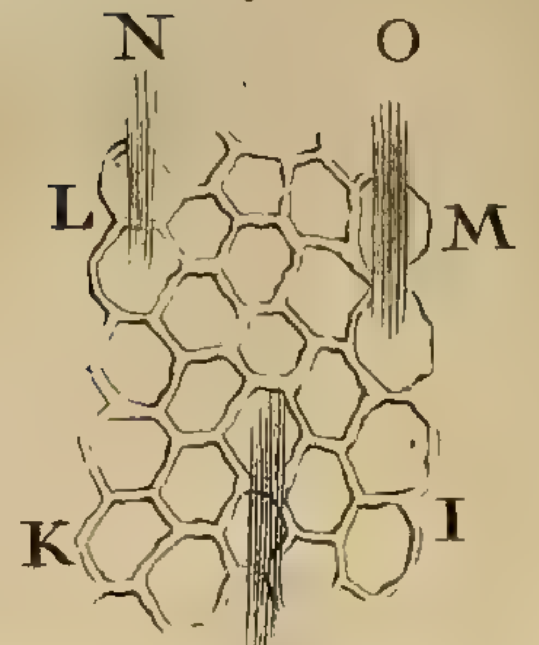

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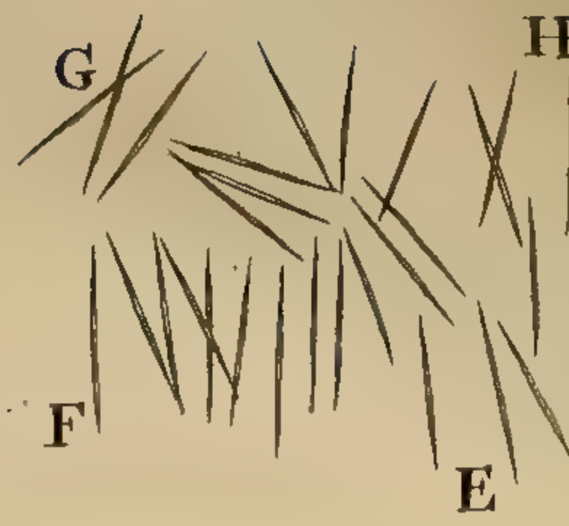

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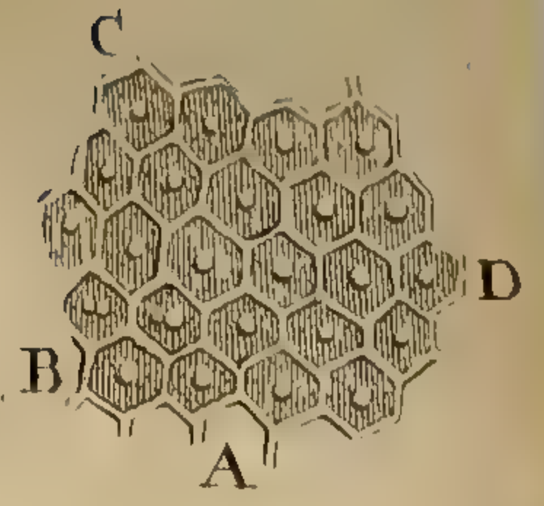

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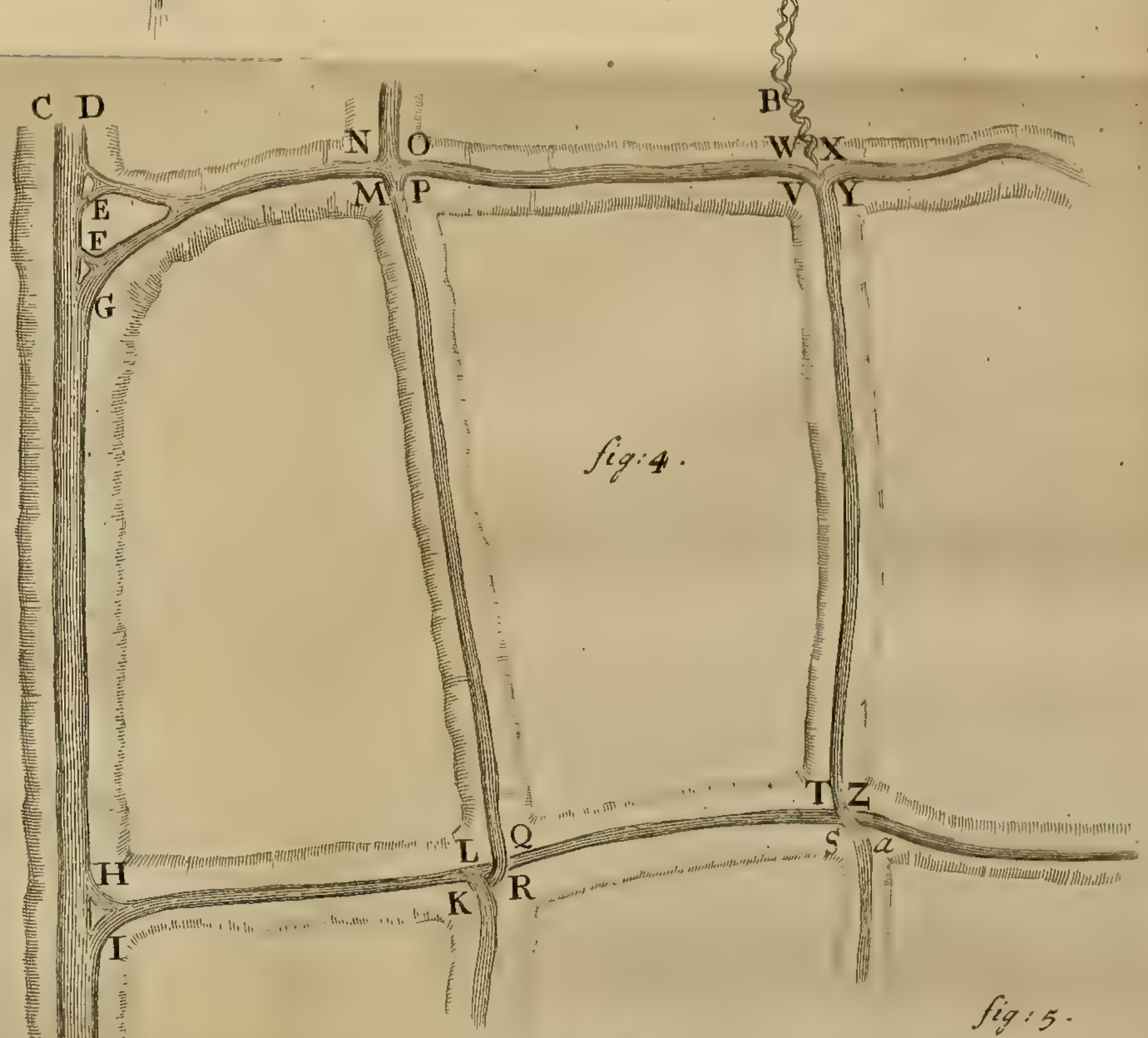

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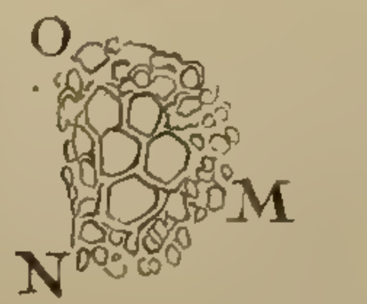

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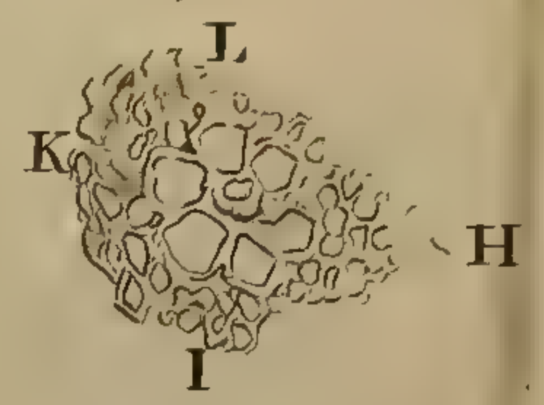

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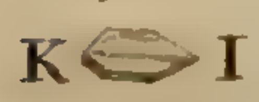

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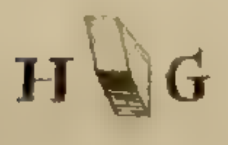

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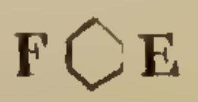

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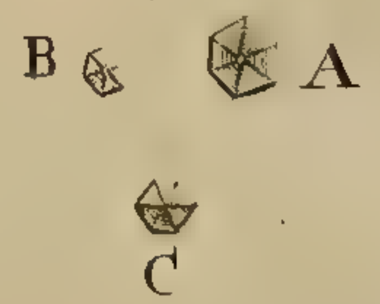

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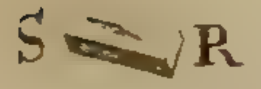

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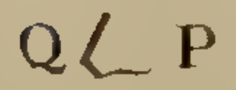

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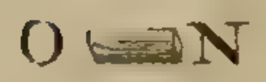

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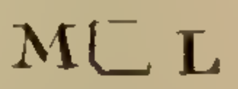

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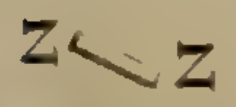

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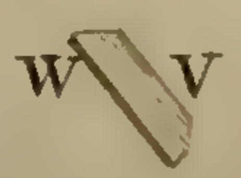

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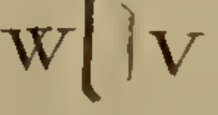

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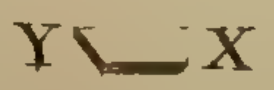

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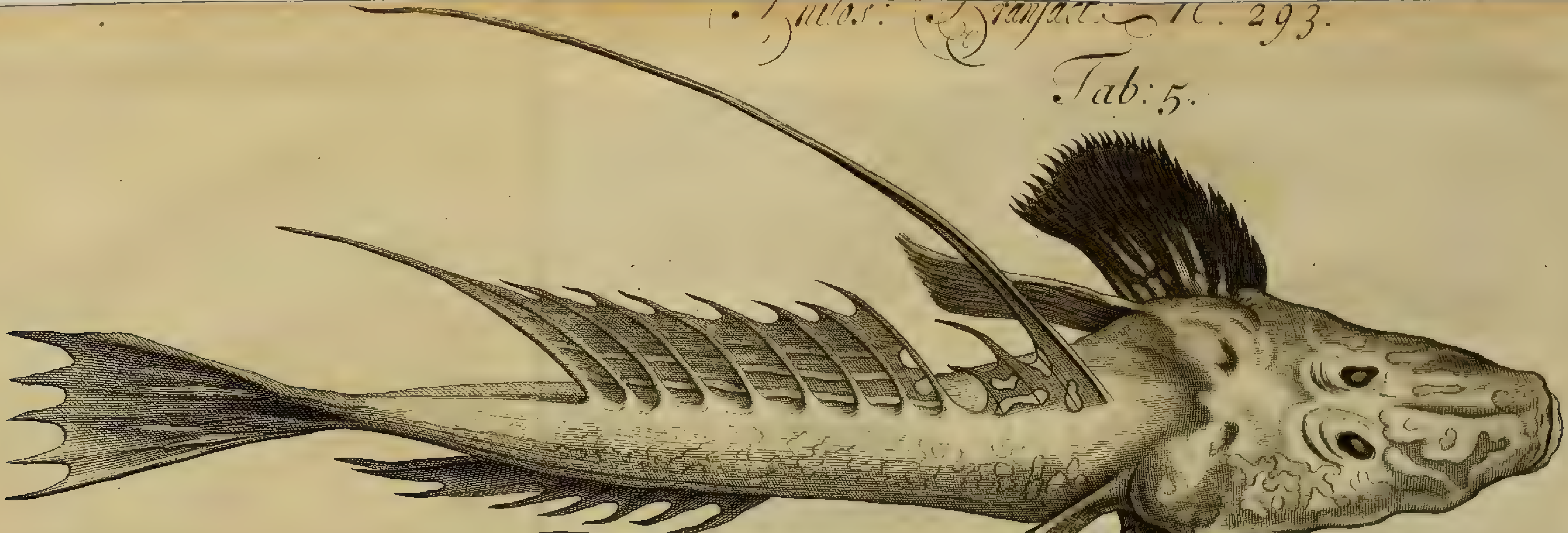

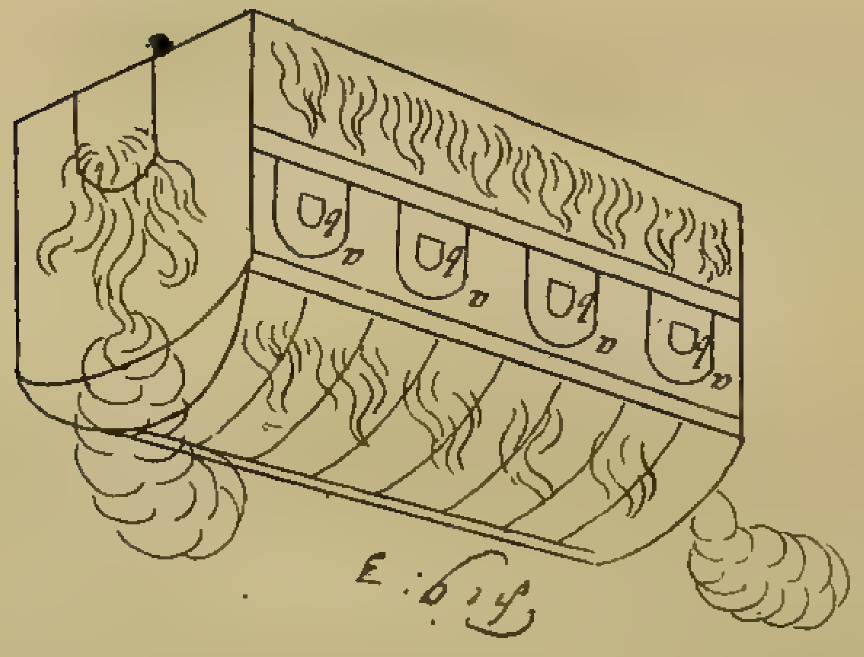
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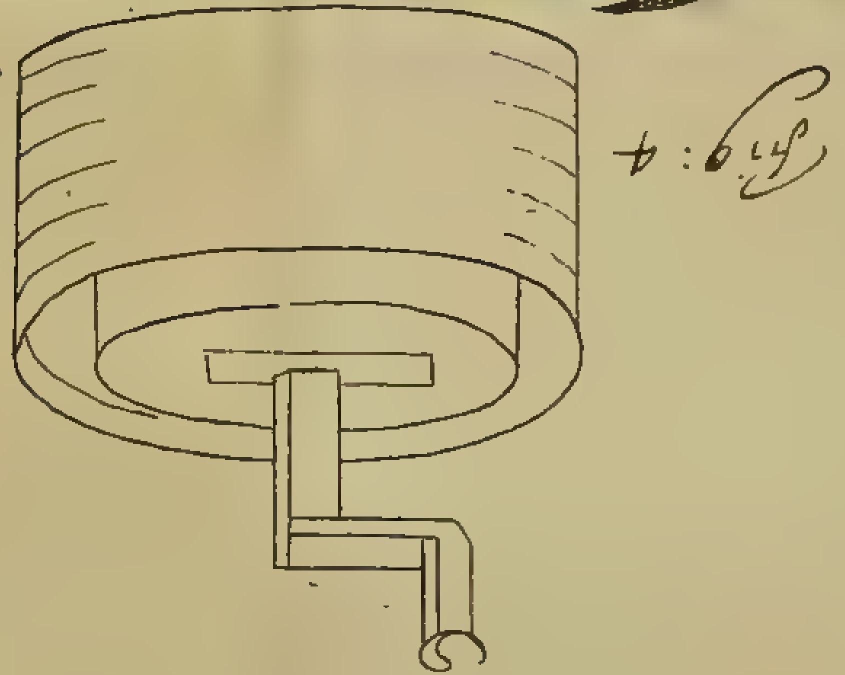
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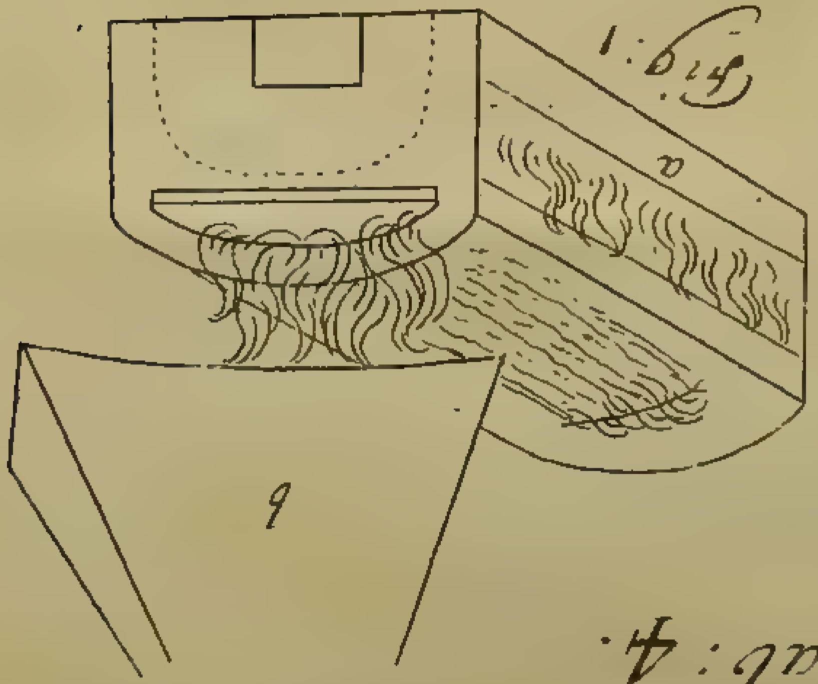
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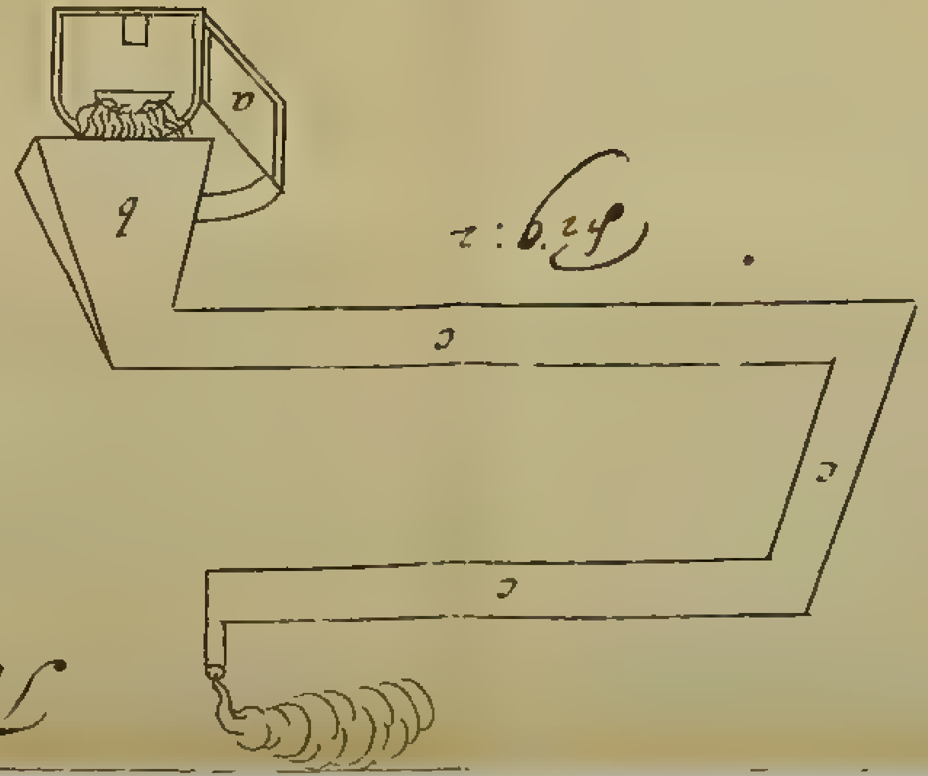
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PHILOSOPHICAL TRANSACTIONS.

For the Months of September *and* October, 1704.

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II. Father Camel *de* Plantis *Philippenſibus* Scandentibus, *ſent very lately to Mr* James Petiver, *F. R. S. to which is added, a* Catalogue *of ſuch* Herbs *he formerly ſent him, the* Deſigns *of which are already* Deſcribed *by that moſt accurate Botaniſt Mr* John Ray, *in the* Appendix *to his* 3*d* Volume of Plants.

III. *A Letter from Mr* Antony van Leeuwenhoek, *F. R. S. concerning the fleſh of Whales, Cryſtaline humour of the Eye of Whales, Fiſh, and other Creatures, and of the uſe of the Eye-lids.*

IV. *A Letter from Mr* Antony van Leeuwenhoek, *concerning the Tubes or Canals that convey the yellow Sap in the Herb called* Chelidonium majus, *or Celandine*, &c.

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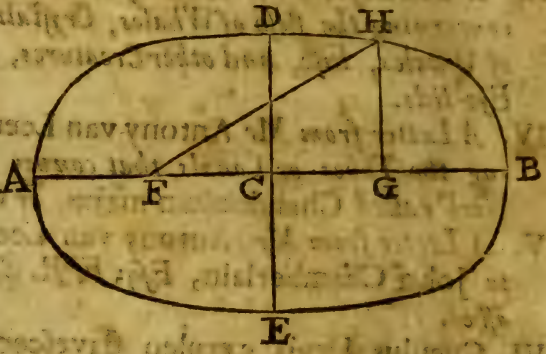
I De Orbita *Caſſiniana.* *By Dr* Gregory.

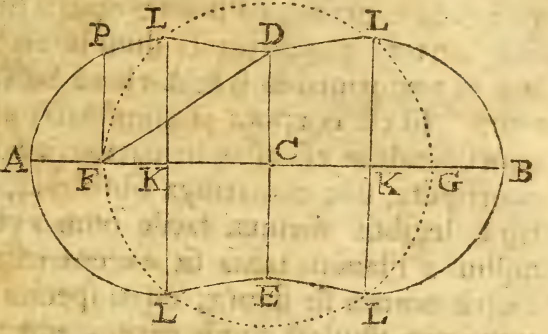
EX quo Celeberrimus *Dom. Caſſini*, in *Tractatu de Origine & Progreſſu Aſtronomiæ*, Curvam quandam pro Planetæ Orbita Aſtronomis propoſuit, & de ipſius Curvæ natura, & de Gravitatis lege ad eam percurrendam requiſita, varie multumque ab eruditis diſputatum eſt. Mihi etiam de eadem denuo cogitanti cum diverſæ ejus ſpecies, tum & harum proprietates aliquæ nondum ſatis perſpectæ occurrebant. Has breviter contexere, & cum iis publice communicare volui, quibus hujuſmodi contemplationes non injucundæ videbuntur.

Satis notum eſt iſtius Orbitæ hanc eſſe naturam. Si a datis duobus punctis F & G ad quodvis curvæ punctum H ducantur rectæ F H, G H; rectangulum ſub F H, G H æquale eſt dato ſpatio. Recta F G hinc inde producta donec curvæ occurrat, oſtendit Vertices A & B; & A B eſt Axis principalis; mediumque inter vertices punctum C eſt figuræ Centrum; & D E, per C ad A B normalis, Axis minor; punctaque F & G Foci.

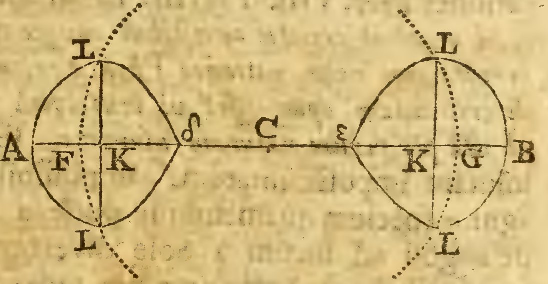


In hac figura ſi axis minor excedat diſtantiam focorum, Curva figuram terminans eſt ubique verſus centrum cava, qualis vulgo habetur. Si, manente axe principali, diſtantia focorum minuatur, augebitur axis minor, qui tamen minor manet axe Ellipſis eodem axe principali, iiſdemque focis deſcriptæ; donec tandem, coeuntibus focis, ille evadat æqualis axi majori, & figura abeat in Circulum. Si vero, e contra, diſtantia focorum augeatur; minuetur axis minor, fietque æqualis dictæ diſtantiæ, cum hæc eſt ad axem principalem ſicut unitas ad medium proportionalem inter unitatem & ternarium.

Si ulterius augeatur diſtantia focorum, minuetur adhuc axis minor, & Curva non erit amplius ad hujus extrema verſus centrum cava, ſed convexa, ut in ſchemate 2; donec auctâ eouſque diſtantiâ focorum, ut hæc ſit ad axem majorem ſicut latus quadrati ad ejuſdem diametrum, axis minor fiat nullus, & curva pertingat ad centrum hinc inde.



Si diſtantia focorum fuerit major quam pro dicta ratione, axis minor fit impoſſibilis, & figura in duas conjugatas abit, ut in ſchemate 3; quæ auctâ focorum diſtantiâ minuentur; donec tandem figura in bina puncta conjugata abeat.



Creſcente porro diſtantiâ focorum, rurſus emergunt binæ figuræ conjugatæ, quæ ſimiliter creſcunt atque prius decreverant a prioribus diverſæ in focorum verticumque ordine, augenturque donec infinitæ evadant. Poſteaque Syſtema hoc iiſdem gradibus ad circulum rurſus accedet quibus ab illo receſſit.

Ex his vel primo intuitu ſatis patetFiguram hanc ad conſtituendam Planetæ Orbitam minime idoneam eſſe. Ut enim taceam caſus ubi in duas conjugatas abit, Orbitæque naturam deponit, nimirum ubicunque tanta ſit ejus excentricitas, quantam Cometæ (ſi circa Solem Planetarum inſtar verſantur, quod veriſimillimum eſt) ad curſum ſuum deſcribendum poſtulant: ut hos inquam caſus prætercam ſunt etiam in ijs caſibus, ubi in ſe redit orbitamque perficit, quædam ejus excentricitates ita amplæ, ut curva prope D & E (Fig. 2.) verſus Solem convexa evadat; adeoq; vi a Sole centrifugâ Planetæ opus eſſet, ut hanc Orbitæ ſuæ partem percurreret, dum interim in locis propioribus & remotioribus B & A vis ad Solem centripeta requiritur. Id eſt corpora circumſolaria eâ lege moveri poſſe concedendum eſſet, ut in paribus a Sole intervallis hic vis centripeta, illic centrifuga obtineret, quod quam ſit a naturæ legibus alienum facile omnes perſpicient. Et licet nullius e Planetis tanta ſit excentricitas, cum tamen Geometris notum ſit figuræ, cujus ſpecies omnes ultra certum terminum muneri cuivis naturæ obeundo ineptæ fuerint, ejus ſpecies reliquas citra dictum terminum, quaſi eidem muneri idoneas, admitti non poſſe: Neceſſe eſt *Curvam hanc Caſſinianam ex Aſtronomia rejicere*, non ſolum ob rationes *Prop.* VIII. *Lib.* III. *Elem. Aſtr.* adductas, nempe *quod neque obſervatis cœleſtibus congruat propter minoris axis brevitatem, neque rationes Phyſicæ reſpondeant, cum ad illam deſcribendam opus eſſet vi centripetâ ad Solem abhorrente ab illa per rerum naturam uſurpata,* ſed etiam propter abſolutam impoſſibilitatem. Impoſſibile namque eſt hujus figuræ ſpeciem quamcunque poſſe a Planeta percurri, ita ut anguli ad focum a Sole diverſum proportionales ſint temporibus; ſic enim area per radium vectorem deſcripta non eſſet tempori proportionalis. Non enim aucto angulo ad focum unum æqualibus incrementis, areæ ad alterum incrementa ſimul facta etiam æqualia ſunt, uti perperam nuper ſentiebam.

In duobus ultimis ſchematibus maxima figuræ latitudo invenitur ſi centro C per focos deſcribatur circulus; ſecabit namque hic Curvam in punctis L, L quæſitis. Eſtque maxima ordinata K L tertia proportionalis rectis G F & F D in horum primo, vel quarta proportionalis ipſis G F, G A, & A F in utroque.

Superſtite D E, ordinata ex foco F P æqualis eſt ſemi-axi minori C D, quando axis minor eſt ad diſtantiam focorum ut latus quadrati ad diametrum. Si diſtantia focorum fuerit major quam pro hac ratione, F P excedet C D.

II. *Georg.*

I. *Georg. Joſ. Camel. De Plantis Philippenſibus ſcandentibus. Ad* Jacobum Petiver, *S. R. S. Delineationibusq; tranſmiſſis.*

Sect. 1. Plantæ *Cucurbitiferæ.*

1. *IGaſod*, ſeu *Igaſur*, quam alij *Pangaguaſon* vocant, Fig *ſive* Nucis Vomicæ legitimæ *Serapionis* Iconem & Deſcriptionem V. D. Anno miſi 1697. vid. Act. Phil. No 249 & 250. Fig. Raii Dendr. 118. 4.

Adde, quod raſuræ *Iſagur* Sanguinem è vulnere profluentem ſiſtat, ut raſura & oſſa *Piſcis Manati* ſeu *Duyiong* & Atramentum *Sinicum*. Filiæ *Tirado* verminanti datum fuit Nucis dimidium, interiit convulſa.

2. *Daocagay*, aliis *Aquaſen*. Planta pariter ſcandens eſt ut *Lactang* & *Piligpog*, ſed magis craſſa, *Cortex* albus, maculis flavis & viridibus variegatus & denuo totus nigris punctuatus notis. *Folia* ſunt *Betele* foliis minora, nervoſa ut *Canelæ* conjugata, quorum ramuſculi deſinunt binis. *Cortex* amaricat. *Lignum* Saporis expers. *Radix* valet contra Venena epota & unà cum vulnere inflicta. *Uſus* ejus cum aliis *Contrayervis*, raró adhibetur ſola.

3. *Pangagbaſun*. Planta arboreſcens, altiſſime ſcandens. *Cortex* ſubfuſcus cum verrucis, craſſus calami Scriptorij. Lignoſa radicum & ſarmentorum materies, poroſa, cum matrice ſpongioſa; ſaporis amari & adſtringentis eſt *Cortex*. Gaudet *viribus* iiſdem quibus *Arbor Pangagbaſun.*

4. Colocynthis *Pomi Roſei*, Indis *Tabaiyeg*. Folia *fert* formæ foliorum *Colocynthidis* retiformis, ſeu *Cucumi-Colocynthidis* ſed ex viridi nitentia & magis terſa. *Flos* luxuriat in racemis ferme ſeptenus, ſpeciali ſtipatus foliolo ceu perianthio, candidus, pentapetalus, petalis nervoſis latis, ſeu frontātis & ſupernè in capillares lacinias diſciſſis: tubuloſo candidove inſidens calyculo in quinos unguiculatos diſcerpto alabaſtros. *Fructus* eſt *Pomum Roſeum* viſu pulchellum, magnitudinis *Pomi* majoris & modice ovati, terſum & perpolitum, durioris corticis, & diutius perennans, cujus caro flavet, & meditullium maſſa coloris luridè cærulei, cui ſemina oblonga, coloris palearis, ſerie trinâ immerſa ſunt, repletur. Sarmentis pollicaribus teretibus & 12 aut 15 orgyijs longis altiſſimas quaſve arbores conſcendit.

5. Colocynthis ***Pomi viridis***. Indis *Bulaſa*. *Folium* habet profundius laciniatum, *ut folium* Citrulli. *Flos* flavus eſt, ſimilis formâ & magnitudine *retiferæ* Cucumi-Colocynthidis. *Fructus* eſt Pomum omnino Sphæricum viride & terſum, *corticis* adhuc ſolidioris quàm præcedentis, coronatum, magnitudinis & formæ majoris *Aurantii*.

Fig. 6. *Cucumi-Colocynthis rētifera*, Indis *Salagſalag*, i. e. *Nidus avium*, alijs *Bujogbujog*, *Pocotpocot*, *Tabobog*, *Cocubitan*, *Guragda*, *Hothot*, *Salimpocot* & *Halahala*; Pepinillo de S. Gregorio *Hiſpanis*. Tota planta cum *Cucumere* convenit, ita ut eam deſcribere ſupervacaneum ſit, verùm quô ad amaritudinem ac vim catharticam & emeticam, *Colocynthidis* modo effiaciſſime operatur, à ſicco fructu ſcilicet ſupermanens reticula. Hujus *fructus* maturus & in ipſa planta deſiccatus colligitur & aſſervatur: Ad quem dein Panaceæ adinſtar recurrunt, & modo ſequenti utuntur: Rejecto ſcabro, tenui, & externo membranaceo putamine, ſeu cortice, excuſſiſque nigris, & copioſis, ex oblongo compreſſis *Seminibus*, remanentem albam, leviſſimam ex tenuibus filamentis contextam, tribus hiantem per longum foraminibus & amariſſimam reticulam, poculo immergunt ferventis aquæ ter ſine mora, aquam imbibitam in idem poculum ſtillare ſinendo, mox aquam illam virtute reticulæ imprægnatam, rejecto rete, ægro propinant. Operatur vehementiſſimè ſuperne & inferne ut *Colocynthis*, facili vero negotio operandi vehementiam infringunt & coercent, lavando ſcilicet manus, tempora, aut etiam pedes frigidâ. Ex hac reticula *Trochiſcos Alhandali* paravi, nec effectus ſiniſtros expertus ſum. *Oleum* ex *Semine* expreſſum acoviſticum eſt & nervinum. *Semen* aſſumptum æque purgans eſt ut rete.

Fig. 7. *Cucurbita Sylveſtris* 1. Indis *Timunay*. Folium gerit *Cucumi-Colocynthide* minus inciſum, at majus & carnoſius. *Florem* luteum pentapetalum, cui ſubnexum eſt folium ſeſquiunciale & orbiculare: *Fructus* eſt *Cucurbita* magnitudinis ovi Struthionis, ex rubello flaveſcens, lævibus obſita aculeis, tota carnoſa, Saccharo condiri apta. *Semen* latum & longum, ferme unciam ex inæquali, compreſſum, & cordiforme.

Fig. 8. Cucurbita *Sylveſtris altera Pyriformis*. Folio *gaudet* magno ſpithameo, tricuſpidato adinſtar tridentis, *Cucurbitulâ* Pyriformi, carinulatâ quæ de rubello & aureolo maturâ contendit colore, palmum longâ.

Fig. 9. Cucurbita ſylv. 3. ſeu *Salapang* nomen tridentis mutuata eſt à tricuſpidato *folio*, quamvis & alia nonniſi una gaudeant cuſpide, alterno palmari, hæderaceo: *Fructus* ovalis eſt, palmo longior, terſus, totus roſeus, qui maturus decuſſatim dehiſcit, & *ſemina* carne molliuſcula, dulci & eſculenta cooperta diſpergit. *Folia* tumores diſcutiunt.

Fig. 10. *Citrullus* Luzonis *Sylveſter* 1. Quibuſvis vicinis trino flagello gaudentibus forficulis ſeſe innectens, *folia* ſuperinſternit mollia, *Bryoniæ* folijs vix non ſimilia. *Flore* luxuriat candido, ſtellari floccellis Cometæ inſtar radiatim caudato, *Fructu* vero ovali, in mucronem prono, *Juglandinâ* nuce vix majori, qui immaturus candido & herbido,

maturus aureo, & ſanguineo gratioſiſſimè *Citrulli* modo virgatim variegatur. *Semen* argenteum eſt ac cruciforme & veluti ſi unum alteri tranſverſim impactum eſſet.

Fig. 11. *Citrullus ſylv.* Luzonis *alter.* Folio *eſt* priori magis inciſo, *Flore* gaudet quinquefolio, majuſculo, candido & in floccos diſcerpto : *Fructu* pallido prioris minori.

Fig. 12. *Citrullus Sylv.* Luzon. 3. *Folio* eſt ſecundo majori, & ſæpius quaſi heptaphyllo, in profundiores lacinias inciſo, uncis claviculis ſeu capreolis ſingularibus ſeſe involvit & vicina amplectitur. *Florem* fert pentapetalum luteum, exiguum. *Fructum* ovalem, qui immaturus ex viridi & candido, maturus ex candido & luteo ſtriatim interſtinguitur & picturatim diſcriminatur. *Semen* mediocre compreſſum.

Fig. 13. *Citrullus Sylv.* Luzon. 4. ſeu *minimus.* Puſillus eſt, coloris crocei, magnitudinis *Avellanæ* majoris. *Folio* lætatur ſeſquiunciali, triangulari ; *Flore* candido, pentapetalo, parvulo, *Semine* quaſi *Boraginis.*

14. *Balſaminam, Momordicam* ſeu *Viticellam* in *Luzone* Indi *Palla* & *Apallia* & *Amargoſam* vocant vel *Paria,* ſponte paſſim ad ſepes provenit. Utuntur decoctâ ad Vomitum provocandum in febribus, cruditate Ventriculi & Obſtructionibus, *foliis* contuſis in vulneribus & ad dolorem capitis leniendum.

15. *Balſamina* altera hortenſis *ſeu* Tabaya calo. *Fructu* luxuriat nonnunquam ſpithamâ longiori, qui aqua ferventi maceratus, oleo, ſale & aceto addito pro *acetario* deſervit, *Indi* tamen & *Viticellæ* ſylv. ſeu Officinarum *veſcuntur ut* hortenſis. Utriuſque *Fructus* ita exhibitus commendatur in dyſenteria & teneſmo.

De *Balſamina* altera *Herbariorum* ſcripſi anno elapſo. *vid.* Kamel. Syllab. *Ray* append. Vol. 3. p. 9. 12.

Sect. 2. *Siliquoſæ* & *Lobiferæ* folii bicuſpidati.

16. Volubilis plantæ *Patin* ſarmenta, ex binis in unum Fig. coaleſcere videntur, quorum decoctum confert in ſputo ſanguinis, Hæmorrhagia & Dyſenteria. *Foliis* ornantur læte virentibus, ſpithameis alternis vexilliformibus ſeu bifurcatis complicatilibus ut fol. *Arb. Alibamban.* *Flores* exeunt racematim, pentapetali, ex rubeo luteſcentes, quorum pediculus bino capreolo quo ſeſe implicando involvit dotatur. *Siliquam* non obſervavi, niſi teneram.

17. Patin *altera.* Folia *promit* palmo longiora, prioris Fig. minus mucronata & minus inciſa. *Flos* magnus eſt candidus, ſtellato-pentapetalus, 10 crocatis ſtaminibus uno umbilico, repletus, inodorus ad foliorum genicula creber & in racemis prodiens. *Siliquas* vero in racemum aggeſtas, fere bipalmares, fuſcas, leviter ventricoſas, mucronatas, *Semen* ſpadiceum, *Lente* majus concludentes.

18. *Duuban* ſeu *Danaquit.* Scandens eſt Planta, *Sarmenta* lignoſa, *Folium* conſtans ex trino ſeſquipalmari aut Fig. bipalmari. Pro *Fructu* fert unciales, ventricoſas, in racemum quandoq; cubitalem congeſtas, coloris cinnabarini ſiliquas, quarum quævis ſuum, ruffum, ad imum innitentem luteæ, carnoſæ & conchiformi appendici, & candidâ obvolutum membranulâ adſtringentem mox dulceſcentem & odoris *Pæoniæ* continet *Phaſeolum.*

Sect. 3. Plantæ ſcandentes *Trifoliæ.*

19. Phaſeolus edulis *Hantac*, magnus eſt & albus.

20. Hantac *matin Dacganay*, parvus eſt, unicaulis & abſq; viticulis, ſiliquas fert congeſtas in ſcapo erecto.

21. Phaſeolus *edulis* Sinenſis, ſiliquâ longiſſimâ, magnus & rubens.

22. *Phaſeolus* Sinenſis *alter*, in multos perennat annos, viret & renovatur, *Sarmenta* brachio craſſiora ſunt, *Phaſeoli* quaſi ex *Piſo* & *Phaſeolo* conſtant.

23.

23. Phaſeolus *Balatong*, parvus eſt, niger & edulis.

24. Balatong *minor*, planta ipſa arbuſculam imitatur, *ſiliqua* brevis, crebra, villoſa, *granum* nigrum ut *Piper*.

25. Phaſeolus edulis *Patani*. Bona major eſt, compreſſior, & ex flavo & fulvo, aut ſubpurpureo picturatus.

26. *Patani* alter, *ſiliquam* fert pedem longiorem, & ſeſquiunciâ latam, edulis eſt ut prior.

27. Phaſeolus *Hervilla*. Folio eſt majori, *Lobo* tenero, albo, ad limites purpuraſcente, carnoſó, veſco, ſupernè adunco, Flore candido, *Phaſeolo* retorto eduli.

Phaſeoli præterea *edules* ſunt, *Ayap, Bulay, Cagios, Baogo, Balolo, Togolobay, Cahay, Lagihay, Kibal, Talipan.*

28. Vitia edulia *Indus* Mongo *vel* Mungo *vocat*, decoctum exhibetur laborantibus variolis.

29. Mongo *oleolo*, i. e. *fatuum*, eſt ſtupefaciens ac inebrians.

Fig. 30. Phaſeolus *Sylveſtris* 1. *Folio* eſt magnô, lætè virenti, parte averſâ ſubhirſuto, elegantius & profundius inciſo, flagellis ſimplicibus prælongis vicina prendens.

Fig. 31. *Phaſeolus ſylv. alter*, Folio ſimpliciori, *Apocyni* ſimili obſoleto, flore prægrandi, incarnato, *ſiliqua* bipalmari, unciam lata, triumbilicali.

Fig. 32. *Phaſeolus ſylv.* 3. Folio oblongo mucronato, *Lobo* unciâ latiori, palmum unum & dimidium longo, brunno, racematim congeſto, qui maturus ruptus cochleatim convolvitur, integer trino hilo ornatur.

Fig. 33. *Phaſeolus ſylv.* 4. Folio eſt ovali, *Flore* parvo candido, trifolio, lobulos plures minimos, congeſtos, in papyraceis utriculis abſcondit, *Semen* parvum nigrum.

Fig. 34. *Phaſeouls ſylv.* 5. Folio eſt *Quarti* magis mucronato, *ſiliquæ* parvæ, in racemo unciales, quarum ventriculi teſſellatim, ſeu anguloſè interciſæ ſunt. *Semen* minimum.

Fig. 35. *Phaſeolus ſylv.* 6. Folio nervoſo in mucronem ex lato vergente, *Flore* purpureo, *Siliqua* ad ventriculos conciſa.

36. *Phaſeolus ſylv.* 7. Folio ex ſubrotundo in acumen abeunte, *Flore* purpureo, *Siliqua* & *Semine* Piſi. Fig.

37. *Phaſeolus ſylv.* 8. Parvulus eſt, *folio Hedyſari* ſeu decompoſito; *flore* amplo cucullato, pulchellè cæruleo, *ſiliquâ* gracili.

38. *Phaſeolus ſylv.* 9. Parvus tenuifolius, *ſiliquâ* holoſericeâ.

39. *Phaſeolus ſylv.* 10. *Bagne.* Succus extirpat *Lichenes.* Fig.

40. *Phaſeolus ſylv.* 11. Eſſe videtur ille *Volvulus trifolius,* Fig. folio ſubrotundo, magno, nervoſo, aſpero, pertinaciſſimè veſtibus inhærente.

41. Phaſeolus *Luzonis* 12. *Folium* habet Phaſeoli, *Siliquam* coloris murini, turgidè ventricoſam, ſeſquipalmarem, ſeſquiunciâ latam, trino vel potius quino hilo donatam, *phaſeolos* coloris terrei, fermè ſex, magnitudinis fabæ, parvos reſpectu turgeſcentiæ *ſiliquæ.*

42. *Volvulus trifolius fructu Papilionaceo.* Folium gerit Fig. trifolium *Phaſeoli*, ſubrotundum obſcurè virens, parte averſâ flavens, palmare ſi magnum fuerit, cujus pediculus capreoli vicem ſubit vicinis ſeſe circumvolvendo. *Viticuli* ſat vieti ſtriati rubentes. *Fructus* eſt *Papilionaceo ſiliquoſum*, fuſcum, binis, trinis aut quaternis donatum pericarpium alis, habens in medio granum unicum, diviſibile, oleoſum, oblongum magnitudinis *Piſi.*

De *Phaſeolis* urentibus *vide* inter *Plantas humiles*, poſt *Xicamam.* Huc refer ſi libet & Plantam *Nami* & *Gavay*, quæ ſimiliter inter *plantas humiles* reperies.

S. 4. Phaſeoli folio compoſito.

43. *Phaſeolus* maximus, *Faba purgatrix* Raii, ſeu Cor Fig. Sancti Thomæ *Cluſii* Indis *Balogo* & *Bayjugu* planta, Sarmentorum & Radicum contuſæ tomentoſæ ſtupæ *Gogo* vel *Gugu*, fructus ipſe ſeu *Phaſeolus* Cabay *ut* Cavay. *Planta* eſt *ſcandens* caudice nonnunquam brachiali, *Folia* compoſita communiter ex 8 aut 10 ſeſquiuncialibus, terſis

&

& ſplendentibus, ad mucronem ut *folia Fagaræ* ſciſſis. Ex medio ramuſculorum, forficulæ exeunt *Vitis* modo. *Fabas* verò illas prægrandes, ex compreſſo-orbiculares, rubro-fuſcas, læves, ſed duriſſimas & quandoque unciis tribus latiores, *lobus* fert niger, leviter ventricoſus, fere ſeſquipalmo latus, & aut cubito, aut ſeſquicubito longior. *Sarmenta* hujus Plantæ ut corticem *arboris Saloguiqui* Indi *Gogo* vel *Gugu* vocant, quæ pariter ut ille & *Radix* quæ odorifera *Saponis* vicem gerit, ad capillitium lavandum. Phaſeoli *Medullam* contra *Aſthma* laudant.

Fig: 44. *Bagdu.* Volvulus eſt ſanè magnus, *foliis* palmaribus ex 10 aut 12 compoſitis, jucundè virentibus. *Floribus* in magnis cubitalibus ramoſis, *racemis* albis, nigris commaculatis notis, pentapetalis in orbicularibus diſcis, ſuaveolentibus, quibus mucronatæ & falcatæ ſuccedunt *ſiliquæ*, quas nonniſi teneras vidi.

45. Huc, ſeu ad *Volvulos Siliquoſos*, foliis compoſitis, ſpectat *Phaſeolus* Sylv. 8. ſupra deſcriptus. Et *Mimoſa* s. Piſum coccineum *Americanum*, ſpec. *Liquir. ſylv.* Indis *Saga mammin*, *Bangati*, *Aquijangyang*, *Mangadolong*. *Caloo* & *Matangpune* vocant. *Folia* fert ex multis compoſita, ſaporis radicum *Liquiritiæ*. Piſa *corallina* in congeſtis lobulis, maculâ nigrâ notata, quæ filo trajecta ut grana & nuclei *Bahay*, *Badiang*, *Tigbi*, *Alalayo*, *Babangun*, *Tonquili*, *Quenang* & *Culanos* interjectis ſeminibus *Amomi* & *Belmuſci*. Indicis *Puellis* torquium & armillarium loco deſerviunt.

46. *Saga* 1. *Bangati* altera. Similis eſt priori, ſed *Folio* hirſuto & inſipido.

47. *Malaſaga.* Planta eſt ſcandens, *ſarmentis* fere craſſitudinis carpi, fragilibus nec vietis. *Folia* gerit compoſita ut *Mimoſa Vulgaris*, ſed quadruplo majora, & inſipida, ut Mimoſæ hirſutæ.

Fig. 48. *Tragacantha* Indica, *Camotcabag* ſeu *Camotbagbayag.* A *Maſſilienſium* & *Granatenſi* diverſam exhibeo *Tragacantham* ſpinoſam nempe fruticem, atq; inter ab *Indis* experientia magiſtra inventa Antidota numeratum. Qui longis & creberrimis aſſurgit virgultis, & qui ſpinarum aduncarum adminiculo, nam quidem abſolute ſcandit ut aliis circumvicinis arbuſtis ſeſe ſuperinſternens longè prorepit & excurrit. Virgulta plurimis cubitalibus ramuſculis brachiata, alijs plerumque 20 ramuſculis minoribus ceu malis folijs compoſitis, quorum quodvis tricenis circiter foliolis, foliis *Tamarindi* ſimilibus, verùm magis dilutè virentibus brevioribuſque luxuriat. Aculeis vero ſenticoſis virgulta præter incertos, & ſparſos ad ramuſculorum exitus & foliorum ſinus armantur trinis ac trinis. *Caulis* craſſo defenditur cortice, & avium unguium inſtar aduncis aculeis. *Flores* pentapetali parvuli bene olentes, lutei, ad ſinus ramuſculorum racematim exeruntur, quibus ſiliquæ leves atque compreſſæ, ad medium aliquantum ventricoſæ, 2. triàve habentes parvis phaſeolis ſimilia *ſemina*, mucronatæ & parte ſupernâ quaſi criſta alatæ, uncias 6 longæ, unam cum dimidia latæ ſuccedunt. *Gummi* autem ex Radice quæ alba & craſſa, uti & caule vulnerato copioſum, vermiculatum candidum & inſpidum profunditur.

49. *Tragacanthæ* 1. *ſpecies altera.* Planta eſt ſenticoſa, longe repens, *Foliorum* ramuſculi componuntur ex 20 folijs compoſitis, quorum denuo quodvis conſtat ex 16 *foliolis* obtuſis, *Senæ* folijs ſimilibus. *Siliquæ* papyraceæ ſunt fuſcæ, tenues, obtuſæ,criſtatæ, creberrimæ in maximis racemis. *Semen* Ceratii cinereo virens.

50: *Tragacantha Luzonis altera.* Calumbibit *Luz.* Dalugdugay *Leytenſibus* vocata. *Folijs* gaudet prioris, majoribus,ſimiliter diſpoſitis ſed in acumen deſinentibus. *Flos* Fig: ſimilis precedenti, *Lobos* habet quales cum fructu *C. Cluſii* Exot. lib. 3. *fol.* 71. titulo *Lobi echinati* delineat, tribus nempe communiter uncijs longos, duabus latos binos pluresve habentes fructus (Hiſpanis *Ojos del Gato*, ſeu *Oculos Cati*, Indis *Bayagcambin* ſive *Teſticuli Canis* : In *Jucatan* verò *Kaknaktuk*, i. e. *Fructum littoralem*, quoniam in littoribus, ut *Cor Sancti Thomæ*, creber colligitur vocant: Ex his *Mexicani* qui *Piedras del Aquila* vocant, *Marem* & *Fæmellam ſeligunt*, copiam eorum aquam immergendo ſupernatantes *Mares*, ſubſidendos *Fæmellas* putant, hos argento cinctos partum facilitare, Venenis reſiſtere, preſervare ab aeris contagio & faſcino ſibi perſuadent ſcilicet præſicinè ut *Iynga*. Nunc Sphæricos nunc leviter compreſſos, coloris ex leucophæo argentei, perpolitos & læves ſolidos & præduro ac pertinaciſſimo putamine ut petræi eſſe videantur contectos leves tamen quive confracti, nucleum album & impenſè amarum continent. Hic aceto forti diſſolutus, & calide illitus *Serpiginem*, *Lichenes*, *Scabiem*, *Pruritum Inflamationes*, *Eriſipelita*, *Ambuſta* & *Tumores Teſtium* ſanat. *Interne* exhibitur in pnlvere a ʒi ad ʒii in *Diarrhæa inveterata*, *aſtmate*, *febribus tertianis* & *veneni periculo ad vomitum provocandum*. Oleum ex *Nucleo* pro contracturis laudatur. *Folio* eadem præſtant. *Corticis* radicum decoctum ſiſtit *Diarrhæas*, & prodeſt *Morbillis* & *Variolis* laborantibus, cooperiendo ſimul totum corpus, folijs *Badiyang* aut *Alagno* ſub cinere calefactis ad ſudorem promovendum, ita enim feliciter evocantur & propelluntur. Radix Maſtichata dolorem tollit dentium.

51. *Tragacantha Luz.* 3. Ramuſculus unus communiter Fig. 12 aliis, quorum quivis ſenis ſtipatur *folijs* luxuriat, læte virentibus & 2dæ majoribus. *Flores* promit ſimiles primæ quales & 2dæ ſunt. *Lobos* fuſcos, unciâ longiores, & hac anguſtiores mucrone deſinentes, unicam & ruffam habentes fabam, medullæ leguminoſæ.

52. Tragacantha *Luzonis* 4. Seu Roſa *Luzonis* ſylveſtris. Fig. *Folia* gerit folijs *Roſarum* ferme ſimilia, & ut hæc diſpoſita crenata, 11 in uno ramuſculo. Senticoſa eſt planta ut antecedentes. Verum non *lobifera* ſed *Pomifera*, quæ parva, magnitudine *Avellanæ*, in racemis, arillis repleta inæqualibus. *Flores* candidi, folijs numero incertis 7 aut 9 repandis, & ſtaminibus crocatis, una cum umbelico repleti.

53. Tragacantha *Luzon.* 5. ſeu *Zebuc.* Folio eſt compoſito, ex foliolis 100 *Acaciæ* veræ minoribus.

54. *Tragacantho* ſimile Gummi, niſi minus mucilagineum & majoribus eſſet in fragmentis, eſt *Ficus* illius *Indicæ*, ſeu *Mexicanæ* Opuntiæ, ſive Tunæ, ſeu *quorundam* Plinii, *&* Theophraſti *Opuntiæ*, in *Jucatan* Nopal, *Mexici* Nochtli. *Hujus* Fructum *Tunam* vocant; *Vermiculos* vero in ea enatos *Mucay*, Mexicani *autem* Nopalnochetzli & inſaniam, Paralyſim & Epilepſiam ſanare ſcribit, & alibi *Coccum Indicum* vocando, Cor, Caput & Ventriculum corroborare tradit. *Hiſpani* ab *Oniſcorum* forma, quos *Cochinillos* ſeu *Porcellos* vocant, *Cochinellam* & *Grana en grano*, Officinæ *communiter* Coccionellam. *Hujus* Nopal ſeu *Mexicanæ* Opuntiæ *differentias* vide *apud* Nirembergium *in* Phyl. Nat.

55. *Opuntia* herbulâ exceptâ, nullam plantam e folijs radices agere, audiviſſe ſcribit *D. Rayo:* Manilæ folia huyatis *Sempervivæ* & *Portulayæ* radices egiſſe ſæpius deprehendi, non tamen ex inde planta aſſurgebat, ſed tantum virebant & vigebant, Imò & cornua radicata *Mariquinæ* evulſi, & alijs monſtravi, ſed hæc luxuries a nimium humida Climatis conſtitutione.

56. Verùm *Tragacanthum Indicum Venereum*, ſeu *Jeo. Schrœdœri* Nidus avium, *Sinarum* Enno, *Indorum* Patong, nidus eſt Hirundinis maritimæ *Salangan* alijs *Sayam* & *Batabota* vocatæ, quæ id ex maris, ut *Indi*, *Sinæ*, Combes & Navarete *affirmant*, ſpuma format & compilat. Invenitur & affertur de *Holo*, *Borney*, *Mindanao*, *Caraga*, *Iloilo*, *Samboangan* & *Calamianes*, ex maris præruptis littoralibus ſaxis affixum, collectum. Utimur eo macerato prius in aqua calida quoaduſq; nihil ſalſuginis reſipuerit, mox repurgatur ab inhærentibus plumis & quiſquiliis minutimve diſcerptum in jure gallinaceo unica ebullitione decoquitur & ægris aut convalleſcentibus, conſumptis & tabidis offertur, eſt autem multum corroborans & ſumme reficiens quia incraſſans, in Diarrhæa proficuum. Hoc *Sinæ* plurimi

æſtimant, quod & *Alexander Rhodes* inſinuat, ſcribens * *Regni Tunchinenſis* primarios juſculis & edulijs, olei locô nidos *Paſſerum* pretioſiſſimos in rupibus Martihis repertos admiſcere, quos *China* maximo coemunt pretio.

Sequentes quadruplices *Lobi*, num ſint Plantarum ſcandentium aut Arborum ignoro.

Fig. 57. Lobus *primus*. Spithamâ longior fuiſſe videtur, coloris eſt fulvi, ventres verò in alterne appenſos diſpoſiti loculos, *Semina* nigra, ſubrotunda, leviſſima.

Fig. *Lobus* 2. Eſt corticoſus, ſolidus, niger & terſus, compreſſus, & trinos palmos longus, uncias 3 latus.

Fig. *Lobus* 3. Similiter corticoſus, ſolidus, niger & terſus, ſed ventricoſus, & palmo uno brevior, oſſiculum continens, cordiforme, compreſſum unicum ſurſum quaſi ungula ſignatum.

Fig. *Lobus* 4. Coloris eſt nativi compreſſus, levis, tener, rugoſê ſtriatus, biventer.

N. B. Beſides theſe *Figured* as mention'd in the Margent, it may not here be amiſs to give a *Catalogue* of ſuch other *Curious deſigns* as this Reverend Father formerly ſent me, which are already deſcrib'd by that late moſt acurate Botaniſt, Mr *John Ray* in the *Appendix* to his 3d *Volume* of *Plants*.

Plantæ *Capillares* & *Saxatiles* Philippenſes. Raij *Hiſtor*. Plantar. *Vol*. 3. Append p. 1.

* 1 *CUſcuta* altera ſeu Major *Kam* pl. 1. Mabuhu. *Luzon*.
* 2 *Adianthum* verum monſtroſum *Kam* 1. 3. Gaz. Natur. Tab. 4. fig. 4.
3 *Adianthum* nigrum quorundam. *Kam*. 1. 5.
* 4 Filix *aurea Naicenſis* Kam. 2. 8.
5 *Filix* major caudice carens altera Kam. 2. 10. Caladondon *Luz*.
* 6 Aſplenium *ſeu* Lonchitis ſcandens *Kam*. 2. 15.
7 *Hemionitis* Luzonis 1. *Kam*. 2. 16.
8 Hemionitis *Luz*. altera *Kam*. 2. 17. Sagumay *Indis*.
9 *Phyllitis* Anglico Luzonis. *Kam*. 2. 18.
10 *Phyllitis* fruticoſa *Kam*. 2. 19. Lagolo *Indis*.
11 *Phyllitis* fruticoſa altera ſcandens Kam. 2. 20. Panapay *Indis*.
12 *Polypodium* Phyllites 1. *Kam*. 2. 23.

13 *Polypodium* Phyllites alterum *Antipolanum.* Kam. 2. 24.
14 *Polypodium* minimum. *Kam.* 2. 25.
15 *Polypodium* parvum Arboris *Zapoth.* Kam. 2. 26. Cabcabun *Indis.*
* 16 *Polypodium* falcatum *Kam.* 2. 27. Bocalas *Indis.* Gaz. Nat. 14. 1.
17 *Polypodium* triphyllum Kam. 2. 28.
18 *Polypodium* Arboris *Balete* Kam. 3. 29.
19 *Polypodium* monſtroſum alterum, *Marianum* Arboris *Rhymay* Kam. 3. 30.
20 Viſcum *Luzon.* 1. Kam. 3. 34. *Dapo* Indis.
21 Viſcum *Luz.* alterum ſ. Crocodiliſugum. Kam. 3. Mampul *Indis:*

De *Cichoraceis*, *Sonchis* &c. Raij H. Pl. Vol. 3. app. p. 3.

22 CIchorium Sylv. *Luz.* 2. Kam. 3. 2. *Arulatag.* Luz.
23 Cichorium *Luz.* 3. Kam. 3. 3. Singandagat *Luz.*
23 Cichorium *Luz.* 3. Kam. 3. 3. Singandagat *Luz.*
24 Chondrilla *Luz.* 1. Kam. 3. 5. Sambongcala *Luz.*
25 Chondrilla *Luz.* 2. Kam. 3. 6. Tabataba coxam *Luz.*
26 Chondrilla *Luz.* 3. Kam. 3. 7. Bitoon *Luz.*
27 Sonchus levis. Kam. 3. 8. Tagolinao *Luz.*

Plantæ *Nodifloræ* Raij H, Pl. V. 3. app. p. 4.

28 *CHamædrys* Sphæritis *Kam.* 4. 13. Balabalanoyon *Indis.*
29 *Chamædryes* ſpecies *Kam.* 3. 14. Hinlalayon *Ind.*
30 Chamæſyce *Luz.* major *Kam.* p. 4. 10. Gataſgatas *Indis.*
31 *Sideritis* Sphæritis *Kam.* 4. 15. Botobotoniſſa *Indis.*
32 *Bellis* Nodiflora fl. perpetuante fruticoſa *Kam.* 4. 18. Bocquingang *Ind.*

Plantæ *Spicatæ* Raij H. Pl. *Vol.* 3. app. p. 4.

33 POlyrrhizos *Luzon.* 1. Kam. 4. 1.
34 Polyrrhizos altera *Kam.* 4. 2.
35 Polyrrhizos *Luz.* 3. Kam. 4. 3.
36 Polyrrhizos *Luz.* 4. Kam. 5. 4. Bucasbucas *Indis.*
37 Polyrrhizos *Luz.* 5. Kam. 5. 5. Yerba de los Paxarillos *Hiſp.*
* 38 *Ruta* Sylv. *Luzonis.* Kam. 5. 6. *Gaz. Nat.* 20. 1.
39 Stachys *Luz.* Kam. 5. 8. Cabling *Indis.*
40 *Gratioſa* ſine flore *Kam.* 5. 9.
41 *Meliſſa* Florida *Kam.* 5. 11. Oia morada *Hiſp.*
42 Hedera terreſtris ſpicata Kam. 5. 12.
43 Verbena *Luz.* Kam. 6. 12.
44 Verbenæ ſimilis *Kam.* 6. 13. Docotdocot *Luz.*
45 Lyſimachiæ ſpecies *Kam.* 6. 15. Capanatolot *Luz.*
46 Carduus aquaticus Kam. 6. 16. Dilivaria *Ind.*
47 Herba Obſtetricum *Kam.* 6. 17. Caſopangil, *Indis.*
48 Telephium Sempervirens *Kam.* 6. 18. Kalanchauhuy *Sinis.*
49 Telephium *Luz.* 3. *Kam.* 7. 22. Yerba del toſton *Hiſp.*
50 Flamula *Sinenſis* Kam. 7. 23. Samtanghuy *Sinis.*
51 Plantago Cervina *Kam.* 7. 24. Catajud *Ind.*
52 Tubularia altera *Kam.* 8. 31. Bagavag *Ind.*

Plantæ *Corymbiferæ*, Raij H. Vol. 3. app. p. 8.

53 ABſinthium Seriphium *Kam.* 8. 1. Capopot *Ind.*
54 Parthenium Maritimum *Kam.* 8. 3.
55 Matricaria huja s *Kam.* 8. 4. Poecachoy *Sinis.*
56 Matricaria altera *Kam.* 8. 5. Roſa de Japon *Hiſp.*
57 Chryſanthemum alterum *Antipolanum* Kam. 8. 7.
58 Chryſanthemum radiatum *Kam.* 8. 8.
59 Chryſanthemi radiati varietas *Kam*, 8. 9. & 10.
60 Moluccana *Acoſtæ* Kam. 8. 12. Agonby *Indis.*

Plantæ *Verticillatæ* Raij H. Pl. Vol. 3. app. p. 9. 9.

61 M*Ari* aut *Polij*, Origanis ſuaviter olentis ſpecies *Kam.* 9. 1.
62 Gnaphalium *Luz.* Kam. 9 11. Varilla *Hiſp.*
63 Lychnis *Luz.* Spinoſa *Kam.* 10. 14.
64 Alſine *Luz.* 1. Kam. 10. 15. Tayutu *Indis.*
65 Alſine *Luz.* 2. Kam. 10. 16.
66 Alſine *Luz.* 3. Kam. 10. 17.
67 Alſine *Luz.* 4. Kam. 10. 18.
68 Alſine *Luz.* 5. Kam. 10 19. Alibangon *Indis.*
69 Alſine *Luz.* 6. Kam. 10. 20.

Plantæ *Umbelliferæ* & *Malvaceæ* Raij H. Pl. V 3. *app.* p. 10.

70 Apiaſtrum *Luz.* Kam. 10. 2. Caffrinno *Hiſp.*
71 Malva *Luz.* 1. Kam 10. 1.
72 Malva *Luz*, 2. Kam. 10. 2. Palis *Indis.*
73 Malva *Luz.* 3. Kam. 10. 3. Pamalis *Ind.*
74 Malva *Luz.* 4. Kam. 10. 4. Paliſpalis in *Indis.*
75 Malva *Luz.* 5. Kam. 11. 5. Padarut *Luz.*
76 Malva *Luz.* 6. Kam. 11. 6.
77 Althea *Theophraſti.* Kam. 11. 7. Paltoc *Indis.*
78 Alcea *Luz.* altera *Kam.* 11. 9. Colotcolotan. *Indis.*
79 Alcea *Luz.* 3. Kam. 11. 10. Gamaygamayan *Indis.*
80 Sabdariffa *Kam.* 11. 12. Malacolotan *Indis.*
81 Paſſao 1. *Kam.* 11. 12. Puli *Luz.*
82 Paſſao altera *Kam.* 11. 13.
83 Paſſao congener *Kam.* 11. 14. Lingindayat *Indis.*
84 Paſſao & Malvaceis affinis *Kam.* 11. 17. Palinſaguin *Luz.*
85 Belmuſcus *Honor. Belli. Kam.* 11. 19. Maricom *Indis.*
86 Althea *Luz.* peregrina arboreſcens Kam. 12. 22. Anabo *Indis.*
87 Althea *Luz.* peregrina altera ſeu urens *Kam.* 12. 23.

Plantæ *Siliquoſæ* Raij H. Pl. *Vol.* 3. app. 12.

88 LUpinus *Luz.* 1. Centuinfolius. Kam. 12. 1. Sambaſamba *Indis.*
89 Lupinus *Luz.* alter tenuifolius, Kam. 12. 2.
90 Lupinus *Luz.* 3. folij punctati. Kam. 12. 3. Tabuhu *Indis.*

91 Lupinus *Luz.* 4. latifolius. Kam 12. 4. Botochotocan *Luz.*
92 Lupinus *Luz.* 5. pentaphyllus Kam. 12 5. Calaycagay *Indis.*
93 Lupinus *Luz.* 6. eſculentus. Kam. 12. 6. Mani *Indis.*
94 Lupinus *Luz.* arboreſcens. Kam 13. 7. Acapulco *Indis.*
95 Fœnum Græcum ſylveſtre Kam. 13. 8. Catanda *Indis.*
96 Plantam *Anil* Kam. 13 9. Tayom *Luz.*
97 Colutea ex *Quaihan* Kam. 13. 10.
98 Colutea *Luz.* fœtida. Kam. 13. 11.
99 Trifolium Dictamnoides 1. *Kam.* 13. 13. Muſ. *Petiver.* 190.
100 Trifolium Dictamnoides alterum. *Kam.* 13. 14. Payangpayang *Ind.*

Plantæ *Miſcellaneæ* Raij H. Pl. *Vol.* 3. app. 14.

101 POlygonum latifolium erectum Kam. 14. 17.
102 Polygonum tenuifolium erectum *Kam.* 14. 18.
103 Polygonum centumgranatum *Kam.* 14. 19. Sambaſamba *Indis.*
104 Scorzonera *Luz.* minima acaulis *Kam.* 14. 20. Lubilubi *Indis.*
105 Cochlearia aquatica *Kam.* 14. 21. Taqueboſo *Indis.*
106 Pyrola *Luzonis Kam.* 14. 22.
107 Myoſotis ſeu Auricula Muris *Luz.* Kam. 14. 23.
108 Acetoſa *Nigritarum* Kam. 14. 24. Lingat *Indis.*
109 Igbangſa *Kam.* 14. 26.
110 Herba verecunda *Kam.* 14. 27.
112 Verecunda minor *Kam.* 15. 28.
112 Stramonium *Luz.* 1. Kam 15. 2.
113 Stramonium *Luz.* alterum 15. 1.
114 Llmeum *Indanenſe* alterum Kam. 16. 30.
115 Limeum *Luz.* 3. Macatenſe. *Kam.* 16. 31.

Plantæ *Arundinaceæ* Raij H. Pl. Vol. 3. *app.* 17.

* 116 ARundo *Indica* farcta. *Vay* aut *Ovay* Indis. *Kam.* 19. 3. G. N. 39. 10.
* 117 Arundo *Indica* farcta *Labiot* Indis. *Kam.* 19. 4. G. N. 39. 11.
* 118 Viſco Bexucus *Nito* Luzon. *Kam.* 19. 1. G N. Tab. 44. fig.
* 119 Amomum legitimum *Dioſcoridis.* Tugus *Indis.* Kam. 22. 1. G. N. 41. fig.
* 120 Amomum verum *Jeſ. Encaladæ* G. N. Tab. 20. fig 2.
121 Calamum odoratum. *Tagbag* Luz. *Kam.* 22. 2.
122 Calamus floridus *Ammomides.* Ganda *Luz.* Kam 22. 3.
123 Calamus floridus ſeu *Ganda* altera *Kam.* 22. 4.
124 Cannacorus 3. *Mamban* Luz. *Kam.* 22. 7.
125 Cannacorus 4. *Abang* Luz. *Kam* 22. 8.
* 126 Zedoaria *Officinarum.* Ray, H. Pl. Vol. 3. app. 23. 9. G. N. 23. 1.
127 Zedoaria altera s. *Gaidoar.* Barac *Luz.* Kam. 23. 10
* 128 Curcuma *Officinarum.* Dulao Luz. *Kam.* 23. 11. G. N. 37. 9.
129 Zerumbeth. *Bangiay* Luzon. *Kam.* 26. G. N. 22. 3.
130 Zinziber *Officinarum.* Luiya *Luz.* Gingu *Sinis,* Kam. 25.
131 Muſa *Arabum.* Sagum *Luzon.* Kam. 24 1.

132 Coſtus *Arabica.* Magbay *Luz.* Kam. 27. 1.
133 Galanga major. *Langcoaz* Luz. *Kam.* 27.
* 134 Ticala *Luzon.* Kam. 27. 3. *Gaz. Nat.* Tab. 18. fig. 7.
135 Amomonte *Luz.* Kam. 27. 4.
136 Pamucug *Luz* Kam. 28. 5.
137 Juncus odoratus 1. Kam. 28. 1.
138 Juncus odoratus 2. Kam. 29. 2.
139 Cyperus eſculentus *Luz.* Apulit. *Kam.* 29. 3.
140 Gramen Cyperoides 1. *Kam.* 29. 4.
141 Gramen Cyperoides 2. *Kam.* 29. 5.
142 Gramen Cyperoides 3. *Kam.* 29. 6.
143 Gramen Cyperoides 4. *Kam.* 29. 7.
144 Gramen Cyperoides 5. *Kam.* 29. 8.
145 Gramen Cyperoides 9. *Kam.* 29. 9.
146 Gramen Cyper. 7. *Malobotan* Luz. *Botoncillo blanco* Hiſp. *Kam.* 29. 10.
147 Gramen Cyperoides 8. *Kam.* 29. 8.
* 148 Contrayerva *Luz.* Doſo. *Kam.* 32. *Gaz. Nat.* Tab. 19. fig. 7.
149 Viſco Aloes *Luz* 1. Malaapag *Indis.* Tiaulan *Sinis.* Kam. 33. 4
150 Viſco Aloes *Luz.* 2. Kam. 33. 5.
151 Viſco Aloes *Luz.* 3. Kam. 33. 6.
152 Viſco Aloes *Luz.* 4. Kam. 33. 7.
153 Viſco Aloes *Luz.* 5. quibuſdam *Vainilla*, ſed perperam. *Kam* 33. 8.
154 Viſco Aloes *Luz.* 7. Kam. 34. 12.
155 Viſco Aloes *Luz.* 8. Kam. 34. 13.
156 Viſco Aloes *Luz.* 9 Kam. 34. 14. *Lanhua* Sinis.
157 Viſco Aloes *Luz.* 10. Kam. 34. 15.
158 Viſco Aloes *Luz.* 11. Kam. 34. 16.
159 Viſco Aloes *Luz.* 12. Bacong Dapo, i. e. *Viſco Pancratium* Kam. 34. 17.
160 Viſco Aloes *Luz.* 13. Talatalaroan *Indis.* Kam 35. 18.
161 Viſco Aloes *Luz.* 13. s. Viſco Pancratium *alterum* Kam. 34. 19.
162 Viſco Aloes *Luz.* 14. Kam 34. 20.
163 Arum *Ægyptium.* Gabi *Luz.* in India *Allu.* Kam. 35. 2.
164 Ariſarum Polyflorum. *Clavoa* Luzon. *Kam.* 35. 1.
165 Arum Maximum. *Biga* Luzon. Kam. 35. 1.
166 Dracunculus *Luz.* 2. Payao *Indis.* Kam. 36. 8.
167 Dracunculus *Luz* 3. Gabinoham Indis Kam. 36. 9.
168 Dracontea *Luz.* Tocotlangit, i. e. *Fulchrum Cœli.* Kam. 36. 9.
169 Dracontium *Luz.* 1. s. Magſoloro minus. *Kam.* 36. 11.
170 Dracontium *Luz.* 2. s. Magſoloro majus *Kam.* 36. 12.
171 Dracontium *Luz.* 3. Lunas *Indis.* Kam 36. 13.
172 Dracontium *Luz.* 4. s. Polyphyllon. *Anum* Indis. *Kam.* 36. 14.
173 Dracontium *Luz.* 5 s. Polyphyllon arboreſcens *Kam.* 37. 15.

N. B. The *Plants* to which this *Aſterisk* (*) is prefixt are already *Figured* in the *Gazophilac. Naturæ & Artis.*

II.

III. *A Letter from Mr* Antony van Leeuwenhoek, *F. R. S. concerning the fleſh of Whales, Cryſtaline humour of the Eye of Whales, Fiſh, and other Creatures, and of the uſe of the Eye-lids.*

Delft in *Holland, July* 22. 1704.

I Take the liberty to communicate theſe my Obſervations, which I made laſt year when our Ships return'd from the Whale-Fiſhery.

I have often concluded, that the Globules of Blood (which are the cauſe of its Redneſs) are of the ſame magnitude both in great and ſmall Animals, and conſequently that the Particles of Blood in a Whale are no larger than in another Fiſh no bigger than a Pin.

Not being able to get at any Whale's Blood, I was forc'd to acquieſce in bare ſpeculations.

From the Particles of Blood my thoughts wander'd to thoſe of the Fleſh of a Whale, whereupon I deſir'd ſome that were concern'd in the Fiſhing to bring me a piece of Whale's Fleſh, imagining that the Fleſh-Particles of the ſaid Fiſh were no bigger than thoſe of a Horſe or Cow, and that the bulk or largeneſs of a Whale conſiſted only in the multitude of number of Particles.

The piece of Whales Fleſh which was brought me had no very good ſmell, by reaſon of its being almoſt putrify'd; I cut it thro croſs-ways, in order to ſeparate the Fleſh-Particles according to their length; and I muſt own, that according to the beſt of my judgment, I could diſcover no difference between the ſaid Particles (in their ſight) and thoſe of a large Ox.

The reaſon why I compare a Whale with a great Ox, is, becauſe I imagin that the Fibres in a great Ox are

not

not more than thoſe of a ſmall one; nay, even in a Calf, I don't think that the Fibres are fewer in number, but only that they encreaſe in bigneſs.

A certain Labourer preſented me with the Chriſtaline Humour of a Whale's Eye, which he call'd the Eye of that Fiſh, and told me, that one of his Neighbours lately return'd from the Whale-fiſhing, had brought it home with him.

After which, the *Heer Frederic Wolfert van Overſchie*, by the intereſt he had in one of the Commanders of a *Greenland* Ship lately return'd from the ſaid Fiſhing, procur'd me two of the *Humor Criſtalinus* of the ſame Fiſh, one was of a great, and the other of a ſmall Whale, ſuppoſing that I ſhould be glad to make ſome remarks on the ſaid Humors.

Of theſe two Criſtaline Humors I diſſected the ſmalleſt, and kept the largeſt entire.

Tab. I. Fig. I. A B. Repreſents the bigneſs of the ſaid Criſtaline Humour when it came into my hands, tho I believe it was ſomething larger when it was taken out of the Whales Eye; for I have obſerv'd, that when I have taken the Criſtaline Humor out of the Cod's Eye, and laid it never ſo gently down, by reaſon of its ſoftneſs, ſome of its ſubſtance fell from it, the which having taken and view'd with my Glaſſes, I could ſtill diſcover in it the Fibrous Matter of which it conſiſted; how much more then muſt ſuch a Humor of the Whale's Eye diminiſh, by being preſerved in Saw-duſt, in order to keep it ſtiff and hard.

The reaſon why ſome of the Sea-faring People take ſuch pains to bring home with 'em the Criſtaline Humor of a Whale's Eye is, to ſhow it as a Wonder that ſo Great an Animal ſhould have ſo ſmall an Eye; for they miſtake that Humor for the whole Eye.

In examining the ſaid Criſtaline Humor it appear'd to me, that the Fibrous Matter or Particles whereof it is compoſed, lay ſo very thin upon one another, making thereby ſuch exceeding fine Scales, that lay ſo prodigiouſly thick upon one another that it was amazing to behold ; and this Fibrous Subſtance is thinner of Particles, than that of a Pearch not a year old.

The reaſon why the Fibrous matter of the Criſtaline Humour of a ſmall Pearch appears Thicker than that in a Whale, is, that we ſee the former on one ſide, where the Threads or Fibres are thickeſt, but if we view them where the Fibrous Particles meet together they are exceeding fine or ſlender ; whereas, on the contrary, the Fibrous Matter of the Whale not meeting together, but running by, by Croſſing itſelf often, is of the ſame thickneſs throughout.

In my Letter of the 14th of *April*, 1684. to the Honorable Society, I imparted my Diſcoveries about the Criſtaline Humor of an Ox, Fiſh, *&c.* and particularly I communicated the Courſe of the Fibrous Matter in the ſaid Humor ; and I have diſcover'd that the Criſtallin Humor in a Whale is of a quite different Texture or Circumvolution from the Fibrous Matter in many Creatures ; for whereas the ſaid Humor in others conſiſts of three particular conjoyn'd Branches, all ariſing out of one Point, the ſame Humor in the Eye of a Whale is compoſed of five Circumvolutions, all which unite together in one Point, and make one Scale : But I muſt here caution you that I only ſpeak of the half of that Orb of the Criſtaline Humor which fell immediately under my obſervation.

Now to deſcribe the Smallneſs, as well as the Fibrous Contexture of which ſuch a Scale conſiſts, and whereof many lying upon one another compoſe the Criſtaline Humour, I caus'd one of 'em to be deſign'd.

Fig. 2. CDEF ſhews a ſmall Particle of the Criſtaline Humor of a Whale's Eye, taken off from the Globular Part; the Real Bigneſs of which, as it appeared to the naked Eye, is repreſented in Fig. 3. by G H.

At firſt I did not believe that I ſhould have attain'd my end, which was ſo to Diſcover the Texture of the Fibres, as to be able to expoſe the exact Circumvolution to my own view, by reaſon that the Scaly Particles were dry'd together ſo hard that they were as clear as Glaſs; but when I had diſſected the Second Criſtalin Humor, after the manner as you may ſee in Fig. 3. G H. I could perceive it very eaſily.

The above-mention'd little Particle Fig. 2. C D E F appear'd no bigger to the naked eye than Fig. 4. I K; in which, by the help of my Microſcope, I could diſcover the exceeding fine Threads, which I call the Fibrous Matter, with a part of the Circumvolution which compoſe a Fifth part or Diviſion of the Hemiſphere of the ſaid Criſtallin Humor.

May we not be amazed with the ſight of ſuch a Contexture, of which the Painter ſaid it was impoſſible for him to Trace the exceeding Fine and Regular Fibres with the Red-lead Pencil, but hoped to be a little more exact when he ſhould come to deſcribe the ſame with his Graving-Iron on a Copper Plate.

Theſe Scaly Particles don't lye thicker on each other than the Threads or Fibrous Matter are repreſented in the laſt mention'd Figure; let us but imagine then how cloſely theſe Particles, lying upon, and near each other, muſt be united; for otherwiſe it would be impoſſible for the Humor *Criſtalinus* to have ſuch a Tranſparency, as the nature of that Body requires.

Now, in order to have a clearer Idea of the Courſe of the Fibrous Matter in the Criſtaline Humor of a Whale's Eye, which Fibres, as I have ſaid before, lye in ſo many folds upon each other, I took a common Ball (for I could not make the Painter comprehend it any other way) and divided it into ſuch parts as were analogous, or correſponded with the Diviſions of the Fibrous Matter in the Criſtallin Humor, and then wound it about with a ſingle ſmall Thread, which was to repreſent the Fibrous Matter that compos'd a ſmall Scale of the ſaid Humor.

Fig. 5. A B C D E F G H I K Repreſents a Globe or Orb of the Criſtalline Humor of a Whale, whereof L is the Center or Axis, and lies next to the view, where the Fibrous Particles ariſe out of the ſhorteſt Circumvolution of the oppoſit part of the Globe, and the Courſe of which is in ſome meaſure deſcribed by the Letters L A. L C. L E. L G. and L I.

As for the Fibrous Subſtance which here does firſt Circumvolve from the Middle point or Center, *viz.* Q B. P D. O F. N H and M K. they deſcribe the ſame Circumvolution in the oppoſite part of the Sphere or Globe, which is here repreſented by L.

Then I cauſed the Painter to deſign the ſaid Ball, that was wound about with a Thread on one ſide, that you may the better conceive the Circumvolution of the Fibrous Matter.

Fig. 6. R S T U repreſents the ſaid Ball ſo well wound up in the ſingle Thread, that there appear'd only the two ends of the ſaid Thread, and the Ball was ſo well cover'd that hardly any of the Leather appear'd.

The Center or Axis, which in Fig. 5. is deſcrib'd by L, where the Fibrous Matter, proceeding five ſeveral ways, does Circumvolve, as A L C. C L E. E L G. and G L I, we muſt ſuppoſe to be repreſented in this Figure by R and T.

In Figure 5. we have deſcrib'd five other, but ſhorter Circumvolutions of the Fribrous Subſtance, as is before ſaid, by the Letters M N O P Q; but when we had cauſed Fig. 6. to be deſign'd, there appear'd but three of the laſt mention'd Circumvolutions, as in the Letters W X Y.

And here again the unconceivable Order and the Wiſdom of the Great Creator of all things is very obvious; for what Man is there in the World that could wind about a Globe or Ball with a ſingle Thread of equal ſize throughout, and not croſs it ſelf in any point; and yet ſuch is the Contexture of the Filaments or Fibrous matter, of which the Scales of the Criſtaline Humour of a Whale are compos'd.

When I talkt with the late *Heer Chriſtian Huygens* of *Zubichem*, about the Criſtaline Humours in the Eyes of Fiſhes, to wit, about the Spherical Figure thereof, his anſwer was; What ſhall we ſay? the Eyes of the Fiſhes are of a wonderful form.

Since which, having carefully obſerv'd the Eyes of ſeveral Fiſhes, and particularly the *Tunica Cornea* thereof, I found that the ſaid *Tunic*, or rather the Pupil or Apple of the Eye, was very flat, like thoſe in Human Creatures and other Animals; from whence I concluded, that tho the Criſtaline Humour in Fiſhes was Spherical, yet the ſame was made good by the Flatneſs of the Apple of the Eye in the ſame Fiſhes; from whence one might probably conclude, that the Eyes of Fiſhes are of the ſame contexture with other Land-creatures, and conſequently the effects in both are the ſame. For if you obſerve the Sphericalneſs of the Apple of the Eye in Men, it will be found to be a large Eye, where the *Tunica Cornea* makes a Circle, whoſe Axis is an inch long.

When I had taken the Eye out of the Head of a living Cod-fiſh, and put the *Tunica Cornea* in ſeveral Copper Globes, or Internal Circles, it appeared to me that the protuberant roundneſs of the ſaid *Tunic* was equal to the Segment of a Circle, whoſe Diameter was of two Inches. The ſaid Eye was a little prominent out of the Head, like thoſe of other Creatures, and tho the *Tunics* or Apples make a larger Circle, yet are they not bigger, and the Axis of the Criſtaline Humour was a little longer than half an Inch.

Now if the Criſtaline Humour (which I have ſometimes call'd the *Criſt. Muſcle*) in our Eyes, and in many other Creatures, conſiſts of a flattiſh roundneſs, but is not perfectly Spherical, and if the Diameter of the Circle made by the Tunick of the ſaid Eyes be an inch long, the Criſtaline Humour in Fiſhes being Spherical, and their Tunick deſcribing a Circle, whoſe Diameter is two inches, all theſe Eyes, as I have ſaid before, may have the ſame effect.

After this I took a Whiting, which weigh'd about 9 Ounces, and examin'd the Eye thereof, which deſcrib'd a Circle of 1 and ½ Inch in Diameter, and the Diameter of its Criſtaline Humour was very near ⅓ of an Inch.

When I diſſected the Criſtaline Humour of a ſmall Fiſh, and found the inmoſt part thereof no bigger than a large corn of Sand, I obſerv'd that the Fibrous particles, of which thoſe exceeding ſmall Scales were compos'd, did conſiſt of as many parts as the uppermoſt Scales of the ſame Humour.

I did formerly reſolve to make a ſtricter enquiry into the Eyes of Fiſhes, but met with ſo many obſtacles, that I cou'd not go through with my obſervations, which made me delay them till now.

Now I am ſpeaking of Eyes, I can't forbear adding, that a certain Gentleman askt me ſome time ſince, why Nature has given us Eye-lids, ſeeing that Fiſhes have none, and that his Surgeon could not tell him the reaſon; I anſwer'd, that it was abſolutely neceſſary for us, and all Land-animals to have Eye-lids; for if it were not ſo, and that the Apple of our Eyes were not moiſtned many times in the ſpace of an hour, and all the foulneſs that might fall thereon, waſht away, our Sight or the *Tunica Cornea* would be ſo clogg'd with filth, that we ſhould not be able to uſe our Eyes; beſides, the ſaid *Tunic* would otherwiſe be parcht up or ſhrunk with heat, and conſequently we ſhould become Blind; whereas on the contrary, Fiſhes living always in Water want no Eye-lids, becauſe the ſame Water keeps their Eyes ever moiſt and clean; with which anſwer the Gentleman was ſatisfy'd. But I have ſince found that I was out in my aſſertion, for Flounders, Plaiſe, Soles, and I believe all flat Fiſhes can cover their Eyes; and if they had not, I fancy they would loſe their Sight, becauſe the ſaid ſort of Fiſh are not ſo nimble as others in Swimming, being only able to move their Tails, the chief Inſtruments of Speed, upwards and downwards; wherefore theſe Fiſhes in a Storm don't betake themſelves to the bottom of the Sea, as I am inform'd, but dig themſelves holes in the Sand, which ſecures them from being caſt upon the Beach or Strand: Now if they had not Eye-lids, the ſharp points of Sand, whilſt they are making their Neſt, would wound the Tunicks of their Eyes, whereby the Tranſparency thereof would be deſtroy'd, and the Fiſhes become blind; which is a farther proof how perfect every Creatare is in its own Species. I conclude, *&c.*

IV. *A Letter from Mr* Antony van Leeuwenhoek, *concerning the Tubes or Canals that convey the yellow Sap in the Herb called* Chelidonium majus, *or Celandine*, &c.

Delft in *Holland*, *September* 16, 1704.

THe *Heer Peter Hotton*, Profeſſor in Phyſick and Botany at *Leyden*, and Fellow of the Royal Society, made me a Viſit lately, and diſcourſing of ſeveral things, he deſir'd me, that I would examin the *Chelidonium majus*, to wit, whether the Canals or Tubes that bring up the yellow Sap were diſtinguiſht or ſeparated from other Tubes;

I comply'd with his requeſt, and imparted to him my poor Obſervations.

He return'd me an anſwer to that Letter, and at the ſame time ſent me a Plant of the *Indian* Fig, upon which the Cochineel Worm, (for ſo the Profeſſor calls thoſe Animalcula) are to be found; and the Leaves of two ſorts of Aloes, to try whether there were in them ſeveral ſorts of Tubes that bring up the Yellow Sap, *&c.*

I think it not improper to communicate to your Honourable Body my poor Remarks upon the ſame ſubject.

You muſt know then, that I firſt obſerv'd the external Skin or Membrane of the Leaves of Aloes, to diſcover, if poſſible, of what Tubes or Pipes they were compos'd; but do what I could, I was not able to find out the Conjunction of the Parts, becauſe that Membrane was ſo weak and tender, that it always broke without any remarkable Diſcovery.

In this Diſquiſion I obſerv'd that in the ſaid Membrane there lay, as it were preſt in roundiſh Particles that look'd like little Bladders, and in thoſe little Bladders, green Particles, that had a Sap in 'em; and they lay as it were in a right Line, and ſo interwoven with each other, that they ſerv'd (as I imagin'd) for Tubes or Canals.

The impreſſions of theſe round Particles was in ſeveral places ſo regular, that each conſiſted of ſix ſides, diſpos'd in the exacteſt order that can be imagin'd; and in each Particle one might diſcover a Protuberance, and they were ſeparated from one another by Rings or Circles, which I ſuppos'd to be the Canals.

I cauſed a ſmall part of the forementioned Hexangular Particles to be drawn juſt as it appear'd thro my Microſcope; ſee Tab. 2. Fig. 1. A B C D in which ſome of the Canals, in order to diſtinguiſh them the better, are repreſented outwards, as at A B C D.

When I examin'd farther into the Aloes Leaf, I diſcover'd another ſort of Veſſels or Canals, in which the Sap appear'd ſomewhat Reddiſh.

I took the Sap out of the ſaid Veſſels, to try whether there were any Salt Particles therein, and what Figure they were of.

I let this Sap ſtand a little that ſome part of it might evaporate, and the Salts coagulate, and placing ſome of it before my Microſcope, I obſerv'd with wonder a great number of long, ſlender Particles, that lay in the Sap, and were ſharp or pointed at both ends; and foraſmuch as I imagin'd that theſe long Particles could not be coagulated in that ſmall time that the Sap was preſt out of the Canals, but rather that they were there before, I endeavour'd to bring the ſaid long Particles out of the Veſſels, ſo that there ſhould come very little Sap with 'em, that the Painter might ſee them more diſtinctly; which having brought to paſs, I cauſed a few (out of ſeveral hundreds that in a ſhort time I had heapt together) to be deſcribed, as you may ſee in Fig. 2. E F G H.

The ſaid ſlender Particles appeared thro the Microſcope very clear and tranſparent; I laid them upon a clean Glaſs plate, and viewing them about three weeks after, I ſaw with wonder that ſome of them had aſſumed a Peach color, and eſpecially ſuch as lay cloſe, or upon one another.

My next Attempt was to know how theſe ſharp Particles were ranged or placed in the Veſſels, and whether they were to be found in all Canals.

At laſt, after ſeveral Obſervations, by Breaking and Cutting in pieces the Aloes Leaves, I brought my matters ſo far to bear, that I placed them ſo nicely before the Painters Eye, that he could not only ſee the foreſaid long pointed Particles lying in thoſe Rings or Circles, which I imagin'd to ſerve for Canals, as in Fig. 3. I K L M, in the middle of five rows between I and K; but I cauſed him alſo to obſerve how that a ſmall piece of Leaf was ſeparated by me after ſuch a manner, that the Ends or Points of thoſe ſharp Particles ſtretcht themſelves beyond the Canals, as is here repreſented in N and O.

Theſe Sharp Particles lay within a ſmall compaſs, like little Bundles, as is ſhown in the figure, but they don't all lye in ſuch order, nor always ſo cloſe to each other, but at a greater diſtance in ſeveral places, and ſometimes indeed cloſer too: Now you muſt take notice that Fig. 3. I K L M, as it appears to the naked Eye, did not cover more Space than a large Grain of Sand; from whence we may gueſs what an infinite number of ſuch Sharp Particles are included in one Leaf of Aloes; in this Figure, or in each of theſe Particles, are a great many parts to be ſeen which ſeem to be Canals; and I ſuppoſe moreover, that each Circle, or the Membranes thereof, in which the Sap, and othet Parts are ſhut up, are alſo full Canals.

Next, we proceed to the Veſſels or Canals, which lye ſomething deeper in the Leaf, and of which I have made ſome mention before; theſe alſo I ſet before the Painter, who has delineated them as in the following Figure.

Fig. 4. A B C D E F G H I repreſents one of the inward lying Veſſels or Canals, which is in a manner ſurrounded and involv'd in a ſort of Matter, which one would take to be a Viſcous or Slimy Matter, and which, as well as I was able, I endeavour'd to ſeparate from it; from theſe Veſſels or Canals in four diſtinct places (and all in a very little ſpace) there proceeded kind of Branches, as two between D E F G, and two between H I, which run croſs from the Leaf.

Theſe Twigs or Branches unite themſelves again in one Vein or Canal that lies juſt by 'em, which is not near ſo great as the firſt mention'd Canal, and this Union or Conjunction is deſcribed by K L M N O P Q R, and there are three ſuch Small Canals to one Great one.

Yea, the ſaid Vein or Canal that runs acroſs is not only joyn'd to a Second aſcending Vein, which extends it ſelf the length of the Leaf, but it goes farther, and falls into a third Canal, which alſo runs the length of the ſaid Leaf, as may be ſeen in the ſame Figure by S T V W X Y Z a; and who knows but if one could inveſtigate the conjunction of the Veſſels, that this order runs through the whole Leaf.

I fancied with my ſelf, that ſome of theſe Veins or Canals were compos'd of long Particles, that extended themſelves parallel, and very near to each other, but in a Winding and Serpentine motion, to the end that the ſaid Veins ſhould never fall in with one another, but always remain open and diſtinct; and agreeably to this opinion, I have ſometimes, but very ſeldom, taken thoſe parts out of the Canals, ſo that the Painter could draw them after me.

In the ſaid Fig. 4. by W B C D E F X is repreſented the laſt mentioned Particle which makes a Canal, but of a very ſmall length, and ſeems to be of a flattiſh ſhape, as between W and B; but viewing it more narrowly, we found that the ſeeming Flatneſs was occaſion'd by the Canals lying ſo cloſe to each other; for we ſaw clearly that B was two diſtinct Canals when they were ſtretcht out, as in B C F; and that one of thoſe Canals was again ſubdivided into two more, as from C to D; and the Painter judged that thoſe ſlender Particles D and E ſtill ſpun themſelves into more ſubdiviſions.

Now one can't come at a ſight of theſe laſt mention'd Parts by cutting the Leaf through, but you muſt tear it in pieces; and even then for the moſt part theſe Canals, with the foreſaid particles, will be alſo broken before one can get a ſight of them.

I have view'd thoſe winding Particles that lye in the Canals or Veſſels of other Leaves, when they were ſo exceeding ſmall and fine, that it was as much as one could do, with a ſharp Eye and a good Glaſs, to perceive their Meanders, or Serpentine Motion.

After this I took that particle of the Aloes-leaf which I had before examin'd lengthwiſe, and cut it acroſs, and view'd it in that poſition, that I might diſcover the Orifices or Openings of thoſe Canals that in Fig. 4. are deſcribed in their whole length by A B C D.

In Fig. 5. H I K L are repreſented (as they appear'd thro a Microſcope that did not enlarge the object ſo much as that thro which I view'd Fig. 1. and 2.) ſix great Tubes, which ſhow themſelves in the laſt mention'd Veſſel or Canal, in which alſo there are a great many other leſſer Pipes.

Thoſe ſmaller Pipes or Veſſels, which are to be ſeen about H, have other croſs Canals that come out of 'em, from whence proceed the inward-lying great Membranes, with the Sap that is in them.

Fig. 6. M N O Repreſents other Canals that were alſo cut acroſs, and in Fig. 7. A. is alſo ſhown by P Q R, how out of the Canals ſo divided the Membranes proceed, in which moſt of the Saps are included, and of which Membranes the greateſt part of the Aloes-leaf is compos'd; and thoſe Membranes, with the Saps that lye in 'em, are ſo clear and tranſparent, that you can ſee nothing but their Circles or Circumferences, as in R Q S T V W X P.

Between theſe Membranes there are Canals, but very few, with their Branches, that run the length of the Leaf, from whence alſo the Membranes proceed; and when I took one of theſe Veſſels or Canals ſurrounded with Membranes, and the Matter ſhut up in them, and ſeparated a little of it from thoſe other afore-mention'd parts, ſo that it was expoſed naked to the Air, it aſſum'd preſently after a Red Colour, whereas thoſe parts that were involved in their Membranes kept, which was a little upon the Green.

This change from Green to Red puts me in mind of what I have obſerv'd ſeveral times in the Eggs of a living Crab, which I have taken out of her, and breaking them in pieces, view'd them, and perceived that the Matter which lay in the Egg-ſhells was Green; but when I let it dry a little, it preſently turn'd from Green to Red.

I cut the great Canals of another Aloes-leaf, acroſs which appear'd Yellow, as did alſo the Sap which came out of the inward lying Membranes; and when I cut a Slip or Slice of ſuch a Leaf, which was as thick as the back of a Knife, and laid it upon a Clean Glaſs Plate, it turn'd preſently to a Peach colour, from Yellow as it had before, and ſo did a ſmall drop of the Sap upon the ſame Glaſs; which being almoſt dry'd up, there appear'd as many Salt Particles in that little Matter, as if the fourth part of it had been mixt with Shining Sand.

I took a little of the aforeſaid Sap, and put it upon my Thumb-nail, and let it dry there, and obſerv'd that it left a Yellowiſh Colour behind it, that the Particles of Salt had coagulated upon my Nail after the ſame manner as a Foggy moiſture is congealed in Winter on Glaſs-Windows; and the next day I perceiv'd a Reddiſh Colour where the Sap had lain, and where it had been thickeſt the Red was deeper, which we call a Peach Colour.

I tryed the ſame experiment upon two other Nails of my Hand, and the ſucceſs was the ſame, and the Colour laſted ſeveral days.

I cut a ſmall Splinter of the Wood, in which there had been ſome Sap of the Aloes, but in which at that time there was but little Color to be ſeen, and placing it before a Microſcope, I ſaw that it gradually aſſum'd a Peach Colour, which in ſome places was as bright and as fine as I ever beheld with my Eyes.

I thought fit to cut off a Slice of the Aloes-leaf from the thickeſt part of it, which appear'd in Fig. 8. A B C, which Letters repreſent the ſide of the Leaf, that, as I imagin'd, was next the Plant; like as C D A the other ſide, which one would take to be the Back of the ſaid Leaf.

That part of the Leaf which we may look upon to be the Skin or Rind of it, and in which the Parts repreſented in Fig. 1, 2, 3 and 4, are for the moſt part ſhut up, is the Space which is deſcrib'd in Fig. 8. between B F, or D H; and between E F G H lies the fore-mention'd Matter, that I liken'd before to a Slimy or Viſcous Subſtance.

As for what concerns the farther texture of the two particular Aloes leaves, and the Sharp Particles repreſented by Fig. 2, and that Matter in the great Canal, which was at firſt Yellow, and ſoon after turn'd Red; I could not diſcover in the ſaid Viſcous Matter any Veſſels that run thro the middle of it, like thoſe which proceeded out of the great Canals, and ſpread themſelves to the innermoſt parts of the Leaf, and were exceeding ſmall and numerous.

I placed another Slice of the Aloes-leaf (which was alſo about the thickneſs of the back of a Knife) upon a clean Glaſs, and view'd it ſeveral times, for the ſake of the fine Peach Colours that were to be ſeen in it; and I obſerved in the ſame, a kind of an oval Figure, that lay in exact order, with its Sap ſhut up in it, after it had been dry about 3 weeks.

I order'd the Painter to draw it, as you may ſee in Fig. 7. B. D E F G H, which ſhows the ſaid Oval Membrane; and F I G deſcribes that part which I call the Canal, and by which I ſuppoſe it is made big, and alſo receives its inward Matter.

In this Figure one ſees a great many Fibres, which I concluded it had borrow'd from other Membranes, as well from thoſe that lay upon it, as from thoſe that lay under it.

Now if we conſider that theſe Membranes can't be coagulated by the Air, ſince they are not made by every Evaporation or Exhalation of the moiſture, but that ſuch Membranes muſt be compos'd (without doubt) of an infinite number of Fibres, ſo ſmall that they eſcape our ſight, we have freſh cauſe to ſtand amazed, and to ſay with our ſelves, what unconceiveable Wonders are ſhut up in ſuch a Leaf.

I thought it not amiſs to repreſent a ſmall Particle of what I call'd the Rind or Bark of the Leaf, as it was cut through acroſs, and dry'd up irregularly.

Fig. 7. A. by R P A B C S Q R ſhows a ſmall part of the Leaf, as it was cut off at Fig. 8. between D H; and which part, with S Q R P A, lay inwards, as is deſcribed in Fig. 8. by H; and in the ſame Fig. 7. A. lay on the outſide of the Leaf, as is ſhewn by B C.

Now theſe parts which in Fig. 7. A are cut acroſs between A B and C S, are the very ſame parts which in Fig. 3. I K L M are repreſented lengthwiſe, with this difference only, that Fig. 7. A. is drawn from a leſs Microſcope.

One would judge that moſt of the afore-mention'd Parts are compoſed of roundiſh Membranes, that include a Sap, which Sap was mingled with exceeding ſmall green Particles, and thoſe Particles are ſo united to each other in right lines, that there is no ſpace between them, excepting that which appears to be Canals.

I told you above, that I had ſqueez'd the Sap out of the Aloes Leaf, in order to diſcover what Salt-particles would coagulate in the ſame.

I placed therefore the ſaid Sap upon my Scrutore ſeveral times, and always obſerved that when the Water was moſtly evaporated, there remain'd abundance of Salt particles behind, which were almoſt all of 'em Quadrangular Figure, and of a Cubical thickneſs, as is repreſented in Fig. 9. between I K. and again ſome ſmaller, as Fig. 10. between L M, and others much ſmaller, as in Fig. 12. nay, ſome of them were of that degree of ſmallneſs that they almoſt eſcap'd the ſight, even with the help of a Microſcope, inſomuch that one could not judge whether thoſe Salts were round or ſquare.

I obſerv'd alſo ſome Figures of Salt that were compos'd of ſeveral, coagulated after ſuch a manner that their ſhape or form was not to be deſcrib'd; and amongſt others there was one Salt Particle that was compos'd of four others, joyn'd together fourſquare cubically, as is deſcribed in Fig. 13. between N and O. I ſaw another Salt likewiſe, that was made up of twenty quadrilateral Salt particles coagulated together, to wit, five in length and four in breadth; and another Salt, in which I counted 30 Particles joyn'd after the ſame manner.

When I took the Sap out of an Aloes Leaf, whoſe Veſſels had a Yellow Sap in them, I ſaw the Salt particles lying ſo clear, as if they were little pieces of Glaſs; and foraſmuch as theſe Salt particles lay ſurrounded with a fine Peach colour, the View of it was very agreeable to the Eye.

From my Obſervations on the ſaid Salts, my thoughts wander'd upon the Aloes it ſelf, as it is uſed in the Apothecary's Shop.

Having then taken a piece of Aloes, and beat it ſmall, being wrapt up in a Paper, and put it into a clean Glaſs, pouring Rain-water upon it, in which I let it infuſe 2 or 3 days, I pour'd off the top of it, and caus'd it to Evaporate, and then diſcovered a great number of Salt particles, of the ſame ſhape and proportion as is deſcribed by Fig. 10, 11, 12, and 13.

There were alſo coagulated a great many Salt particles, that were of ſuch a figure as is repreſented by Fig. 2. E F G H; only with this difference, that they were

ſome-

ſomething thicker and ſhorter alſo in the middle, and ſome of 'em not ſo even or ſmooth as in the ſaid Fig. 2.

The ſaid *Heer Hotton* ſent me alſo a little Plant of Dragons Blood, in *Latin*, *Lapathum Sanguineum*; in which I view'd the Stalk of the Leaf after I had cut it acroſs, and diſcover'd at the ſame time ſeveral particular Colours of a light and of a deeper Red, more than one could imagine to ſee at one view: And I did obſerve in the ſaid Stalk, little places in which I could perceive no Colour; but when I cut the ſame Stalk lengthwiſe I could then ſee that thoſe places were Canals, through which I concluded the Red Sap paſt, and that thoſe many Colours which lay in thoſe Canals were a ſort of Bladders, that contain'd the Sap in them, and that thoſe ſeveral Colours were wholly produced by the Sap that ouz'd thro the ſides of the Canals, and ſo made the whole Stalk Red.

V. *A Letter from Mr* Antony Van Leeuwenhoek, *F. R. S. to* John Chamberlain, *Eſq*; **S. R. S.** *concerning Tobacco-aſhes.*

Delft, Octob. 3. 1704.

I Take the Liberty to acquaint you, that ſoon after I had communicated to you my Poor Obſervations about a Tooth which was thought to have Worms in it, *&c.* I again examin'd the Aſhes of Tobacco; and ſince the Remarks upon that ſubject are fallen into my hands within theſe few days, I have taken the liberty of ſending 'em to you; hoping there may be ſomething in 'em which may ſerve to divert you: The ſaid Remarks are as follows.

For my Satisfaction I deſired a certain Gentleman, who I knew Smoaked every day, to ſave me a little of the Tobacco-aſhes, as they came out of his Pipe, but none ſuch as were throughly burnt; my Friend gave me about 2 Thimbles full of the ſaid Aſhes, of which I put part into a Glaſs Tube, and pour'd Rain-water upon it, and when I had mingled it well with the Water, and that the Aſhes were ſubſided, the Aſhes took up one part of the ſaid Tube, and the Water ſtood above it two parts more.

Altho theſe Aſhes were of a Grey colour, and had all the Particles thereof appear'd to the naked Eye to be entirely burnt, yet I could perceive, after the mixing of the Water together, that there were remaining ſome exceeding ſmall Particles of Tobacco, that were not turn'd into theſe Grey Aſhes.

After that the Water had ſtood 24 hours upon the ſaid Aſhes, I took a little of the ſame, which to the ſight appear'd very clear; but when I obſerv'd it with my Microſcope, I ſaw that it was impregnated with a great many ſmall Particles, which were about the ſame Weight and Heavineſs with the Water, for they did neither ſubſide to the bottom, neither did they emerge to the Superficies of the Water.

I view'd this Water with five Diſtinct Microſcopes, to ſee what Salt Particles would come to light, after that the Water was evaporated.

Tab. 3. Fig. 1. A B C repreſents three diſtinct Salt Particles, which, tho they were Hexangular, and ſo Tranſparent, as if they were made of Glaſs, yet their Sides roſe into Pyramids, juſt like Criſtals grinded into ſix Sides, ending all in ſharp Points, only with this difference, that the Superficies of Fig. A. appear'd with ſix equal ſides, but tho there could be no Superficies diſcover'd in B and C, yet that which appear'd but one Point, was, I doubt not, Hexangular alſo.

Amongſt, and about theſe Salt Particles there lay a great many others, in which, by reaſon of their exceeding ſmallneſs, the Form or Shape was not to be diſcover'd, excepting ſome of the biggeſt of 'em, which I could juſt perceive to be Hexangular; and ſuch Salt Particles as theſe I have in all my Obſervations diſcover'd amongſt divers ſorts of Salts.

I ſaw alſo other Salt Particles lying that were Hexangular too, but quite Flat, of which I have ſeen but few, as they are here repreſented by Fig. 2. E F; near which there lay another kind of a Salt, that appear'd to the Painter like Fig. 3. G H.

I alſo obſerv'd ſeveral Salt Particles like Fig. 4. I K, only with this difference, that they had two ſharp Points at I.

I took notice likewiſe of ſeveral regular Square Salts, and one alſo that I lookt upon at firſt to be of the ſame Figure, but viewing it narrowly, I found it had two Blunt, or Pared off Angles. See Fig. 5. L M.

There were ſeveral other Salts, which one would take for Quadrangular Figures, as ſeeming to have 2 long, and 2 ſhort ſides, but viewing 'em more nicely, I found 'em alſo to be Hexangular, as Fig. 6. N O.

Other Salts appeared like equilateral Triangles, the Angles of which were cut off, but thoſe cut off Angles were in one Salt Particle, Fig. 7. P Q repreſented bigger than in others.

The Painter obſerved one Salt Particle repreſenting an Oblong quadrilateral Cube like Fig. 8. R S.

I ſaw alſo ſeveral Salt particles, of which ſome were much bigger than others, as indeed all the reſt of the Salts were, which appear'd like Fig. 9 and 10. V W.

There were ſome Salts too, but very few, that were Quadrilateral, and at one end the Angle was Acute, at the other Obtuſe; as in Fig. 11. X Y.

I

I ſaw likewiſe ſeveral Long and Slender Salts, that appear'd like Fig. 12. Z Z; the which Salts were ſo cloſely linkt and joyn'd to each other, that one would be apt to take 'em for one long and ſlender Particle, but viewing them more narrowly they appear'd to be ſeveral linkt together.

Moreover, I try'd theſe Aſhes three ſeveral times in a ſtrong Fire, (having kept them in a ſmall clean Wooden Box) to ſee what Volatile Salts could be extracted from them; and always obſerved that firſt a very clear Liquor did exhale from the Aſhes, which at the laſt Evaporation was accompany'd with a Yellowiſh Oyl, and which Oyl was coagulated after ſuch a manner, as if they were mingled with Salts.

I ſaw alſo a great many ſmall Watery parts, which one might call a Spirit; and an extraordinary great number of little Bubbles, which I judged to be really Oyl, of which ſome of them were ſo much ſmaller than others, that they almoſt eſcaped the ſight through a good Microſcope.

There were moreover on the ſides of the Glaſs ſome very ſmall Particles, that were neither Water nor Oyl, which I imagin'd to be Volatile Salts, but not being able to diſcover in 'em any exact form, I can ſay nothing certain of them; and I have alſo always obſerved that when I brought the Glaſs where it was cover'd with the Tobacco Aſhes, to ſuch a ſtrong Fire, that it was put into Fuſion, the Aſhes, or rather the Salts thereof, united themſelves with the Glaſs, and the Glaſs aſcended with Air bubbles, and with a ſtronger Fire there was cauſed a Hole in the Glaſs.

I have ſeveral times, for my Curioſity only, taken a ſmall piece of our *Delft* Earthen Ware, which was but once baked, and conſequently not Glaz'd; and made a ſmall Cavity in it, ſo that it ſerved me for a Teſt or Shell, ſuch as the Refiners with Bone Aſhes uſe, and put into the ſame a little bit of Gold or Silver, together with ſome Lead.

I ſet this Shell upon a large piece of lighted Charcoal, ſuch as I judged ſufficient for my purpoſe, and blowing the Flame of a Lamp through a Pipe, I cauſed the Lead to evaporate, but the Gold ſtay'd behind; yet it has ſo happen'd ſometimes, that the Melted Gold or Silver has made ſuch a deep Pit in the Earthen Shell, that I have been forced to make uſe of a ſecond, if I would clear it of all the Lead.

After I had evaporated the above-mention'd Lead, I put a little Tobacco Aſhes into one of theſe Earthen Shells, and in the ſpace of two minutes, with a ſtrong Flame of a very thick Tallow Candle, moſt of the Aſhes was turn'd into ſmall Globules, and the remainder was in a manner nothing but Salt.

After this I took 3 parts of a certain ſmall Weight of the ſaid Tobacco Aſhes, and proceeded therewith as I had done before, and after the ſpace, as I judged, of a little more than two minutes, I took off the Shell from the Fire, and found that the remaining Aſhes weigh'd a very little more than two parts, and that the Shell, on that ſide that was moſt expoſed to the Fire, was turn'd into a Glaſſy Subſtance.

The Aſhes thus prepar'd, which rather lookt like a Petrify'd Matter than Aſhes, I put into a Clean Glaſs, and pour'd Water upon 'em; and ſtirring it about with a Copper Wire ſeveral times, I let it ſtand 24 hours, and then decanted off that which was ſettled and clear to the ſight, of which having put a very ſmall quantity upon a clean Glaſs Plate, and view'd it thro ſeveral Microſcopes, I always obſerv'd, in a little time after, a great many Salt Particles coagulated, that were neither Flat nor Slender, but moſt of 'em as Thick as they were Long, and almoſt each of 'em of a particular ſhape, which it was very pleaſant to ſee; and tho I lookt upon a great many of the ſaid Salts, I found none that agreed with Fig. 1. A B C, Fig. 2. E F. or Fig. 5. L M.

Among theſe Salt Particles there lay ſome ſo very ſmall, that I could not diſcover their exact form, tho I uſed never ſo large Microſcopes, yet I was well enough ſatisfy'd that they were Salt particles extracted from the Tobacco Aſhes.

I obſerv'd alſo, that upon ſome Aſhes that were not mixt with the Water there lay a white ſubſtance, which I imagin'd to have ſunk and deſcended leiſurely, becauſe it lay higher in the middle than next the ſides of the Glaſs; and I took this White Matter to be coagulated Salts, which being heavier than the Water, had ſubſided upon the reſt; and ſo I found it to be; for when I took it out of the Water, and view'd it with the Microſcope, I had the pleaſure of ſeeing a vaſt number of Salt particles, each of 'em of a particular figure, and as clear as Criſtal; tho they appear'd leſs to my ſight than thoſe which I caus'd to be delineated.

For my farther ſatisfaction, I prepar'd exceeding thin and flat little Glaſſes, which I plac'd ſo clean before the Microſcope, that I ſuffer'd them not to be touch'd with any hand, to the end, that there ſhould not appear the leaſt ſpot or miſt upon them.

Moreover, I took a new blown Glaſs Tube, and put into it a little of the laſt mention'd Water, and viewing it with my Microſcope, I ſaw two Particles therein, which I judg'd to be Salts, whereupon, I pour'd out of the Tube a drop of Water no bigger than a large grain of Sand, which ſpread it ſelf ſo much upon a Glaſs Plate, that there did not remain above a fourth part of it that was capable of being ſeen, in which I diſcover'd, to my great ſatisfaction, ſeveral long Particles, which I can liken to nothing better than the Hair of one's Beard of two or three days growth after ſhaving; and theſe Particles I diſcover'd, according to my computation, in the ſpace of

a

a minute, whereas I ſaw nothing before but a fluid clear Water; and after the ſpace of another minute, the ſaid Particles were increas'd to the number of thirty, ſome of which were floating up and down in the little moiſture, and were grown thicker and broader, eſpecially ſuch as lay at ſome diſtance from the reſt; and ſome were ſo thick and broad, that they far exceeded the others in largeneſs; and when the Water was almoſt all exhal'd, I ſaw a great number of very ſmall Particles, in which I could diſcover no figure, and then my agreeable proſpect was at an end, becauſe all the Salt particles were ſurrounded with a Watery Humour which did not evaporate, the cauſe of which was, the Rainy Weather, with a Foggy Air and a South Wind.

I have endeavour'd to ſee this agreeable ſight more than once, but could not obtain a diſtinct view of the Salts.

I did not ſucceed in my laſt Obſervation till after the Water had ſtood 3 days upon the Tobacco-Aſhes.

Moreover, I took the Glaſs in which the Tobacco-Aſhes were, that I had reduced to a Petrify'd Subſtance, and held it over the flame of a Candle till the Water boyl'd, for the ſpace of two minutes, and the ſaid Subſtance was ſeveral times lifted up in the Water, expecting that by the ſaid Heat the Salt particles ſhould be diſſolv'd, and incorporated with the Water, which, as I ſaid before, lay coagulated like Cubes in the Water, to the end that I might make ſome new Obſervations; but I could not bring it to bear, foraſmuch as almoſt all the Salts lay in the Water coagulated and linkt by hundreds together, ſubſiding in the bottom, or elſe ſticking to the Glaſs.

All theſe Coagulated Salts were ſo ſmall, that let me uſe what Microſcope I wou'd, I could not fully diſcover their figure, which however I took to be Hexangular, and t hemore becauſe I took them all to be of the ſame bigneſs; neither could I, as before, ſee one Salt particle in ſo great a number, that was bigger than the reſt, tho the Water had ſtood ſome days upon the Aſhes.

Thereupon I pour'd out the Water and the Aſhes together from the Tube, and caus'd the Water to evaporate leiſurely over the Fire, and laying the remaining Aſhes upon a piece of Earthen Ware, I made it red hot, and after it was cold, I crumbled it to pieces between a Paper, and then putting it into a new Glaſs, and pouring a little Water upon it, I expected to find that the Salt particles by the force of the Fire were diſſolved, and would be united to the Water, whereupon I renew'd my Obſervations, pouring the Water leiſurely, to the end that the multitude of Salt particles, in the evaporating of the Water, ſhould not coagulate too faſt, and ſo hinder an exact view of them; and I ſaw ſeveral times, to my great ſatisfaction, that the Salt particles (tho unſpeakably ſmall) were Hexangular, as in Fig. 2. E F, but ſome of 'em longer than others, and ſome much larger; and ſome again ſo ſlender, that by reaſon thereof I could not have ſeen them, had not the circumference of them been thicker and brighter than the reſt.

Hereupon I took again a little Water of the Aſhes of Tobacco, as clean as they came out of the Pipe, and mixt the ſame with pure Rain water, and found the ſame effect in the Coagulation of the Salts as before.

Altho among the aforemention'd Figures of Salt I diſcover'd ſeveral others, I concluded that all thoſe Salt particles that were not Hexangular were of another form, by reaſon of the Coagulation, or Inclination of the Salts to one another, which happens more in ſome places of the Water than in others, whereby the Salts aſſume a Figure that is not proper to 'em.

After that the Water had ſtood ſix hours upon the Tobacco Aſhes, which I had twice put into a glowing

Heat, I obſerved a great many Cubical Salts of ſeveral figures, that were coagulated in the Water, whereas I could ſee but two ſuch Salt particles in the Water that was pour'd upon the Tobacco Aſhes juſt as the ſame came out of the Pipe.

This laſt experiment of mine was made in very moiſt weather, in which the Salt particles did not only coagulate, but they were alſo ſo tenacious of their figure, that I ſcarce ever obſerved any Salts extracted from burnt Matter ſo ſtubborn and ſtrong as theſe.

I put the Glaſs a ſecond time over the flame of a Candle till the Water actually boyl'd, and then viewing it, I ſaw ſome Great Particles that were very dark, and ſurrounded with abundance of very ſmall Particles, of which I could not diſcover any figure, no more than of ſeveral other ſmall Particles, which I lookt upon to be Salts.

Theſe are my Obſervations and Experiments upon this ſubject, which I thought fit to communicate to you.

VI. Cuculus Lævis cæruleo flaveſcens, cui in ſupremo Capite Bronchiarum Opercula.

O R,

The Yellow Gurnard.

By Edward Tyſon, *M. D. Fellow of the Coll. of Phyſicians and R. S.*

IF we may juſtly infer on Identity of *Species* in Fiſhes, from the likeneſs of their Fins, we have then ſome ground to conclude, that this Fiſh (I am giving an account of, and which has not hitherto been deſcribed by any, as I know of) ought to be referred to the *Gurnard* kind. Not but that in many particulars, and thoſe very remarkable too, it differ'd from it. However, not finding any other *Species* it agreed with better; and the Fiſhmonger that ſent it to the R. S. not knowing any Name 'twas call'd by where taken, which was about *Haſtings* in *Suſſex*; I ſhall take Liberty to call it the *Yellow Gurnard*: and that I had ſome Colour of reaſon for doing this will appear, when I have compared this Fiſh with the *Red Gurnard*, and ſhewn wherein they agreed or differ'd.

And firſt of all, as to the general Shape of their Bodies I found an agreement enough. In both, the Head was the biggeſt part; the Body thence gradually ſtill leſſening and growing taperer, as it approached the Tail, where 'twas very ſmall in both. The *Yellow Gurnard* meaſured eleven inches in length, whereof the Tail was two. The Girth of the Head was four inches and a half.

The Fins, as to number and ſituation, or placing on the Body, were exactly the ſame in both; I ſhall therefore omit their deſcription, and only take notice wherein they differ'd in other Circumſtances. As in the fore Fin on the Back of the *Yellow Gurnard*, there were four or five *Radij* or Spines; whereof the firſt was ſix inches long; the next about two; the others ſhorter: In the *Red Gurnard* in this Fin were ſix ſtrong bony Spines, ſharp-pointed; whereof the ſecond from the Head being the longeſt, was only a little above an inch, and the reſt not much ſhorter. Note, the *Red Gurnard* I had to compare with, was but ſmall, and ſomething leſſer than the *Yellow* one.

In the hinder Fin of the Back of the *Yellow Gurnard* there were nine *Radij*; in the *Red Gurnard* fourteen; in both, the *Radij* near the Tail were the longeſt; thoſe in the *Yellow Gurnard* being two inches and a half long.

The Membrane that joyned theſe *Radij* of the Back Fins, as to Colour differ'd very much in theſe Fiſhes. For in both the Back Fins of the *Red Gurnard* this Membrane was all of a White tranſparent Colour. In the fore Fin of the *Yellow Gurnard*, the Membrane was yellowiſh with blue ſpots, and ſome edged with black, and the Membrane of the hinder Fin was of a faint bluiſh Colour, with four Yellow liſts or ſtreaks about a line broad, running the whole length, as in the Figure.

The *Pinnæ Bronchiales* (whereof there were two of each ſide, and their ſituation in both, the ſame, the uppermoſt being inſerted Perpendicular, the lowermoſt Horizontal to the Body) differ'd likewiſe in Colour. For in the *Yellow Gurnard* the uppermoſt Fins were white; the lowermoſt of a dark blackiſh Colour, with ſeveral beautiful long ſpots of an Azure blue. In the *Red Gurnard*, the uppermoſt Fins were of a dark reddiſh Colour; the lowermoſt white: But here between theſe two Fins I ob-

obſerved three naked *Cartilaginous Radij*, which are not in the *Yellow Gurnard*, and are well Expreſſed in *Salvianus*'s Figure of the *Red Gurnard.*

The Fin on the Belly was plac'd exactly alike in both. The *Yellow Gurnard* here had nine *Radij*, and its Membrane of a darkiſh blue Colour. The *Red Gurnard* had 17 or 18 *Radij* here, and its Membrane tranſparent white. The Tail in both was much the ſame.

Over the *Anus* in the *Yellow Gurnard* was a ſlender pendulous body, which was not obſerved in the *Red Gurnard.*

The Colour of the Body of theſe two Fiſhes differing likewiſe very much; and I know not, but that it may be a Property in this Species to vary in Colours, more than other Fiſhes do. The Belly of the *Red Gurnard* was of a Silver Colour, and ſome part of the Sides near the Belly: the reſt, and the Back and the Head, were of a reddiſh Colour. In the Head there were were ſome ſmall whitiſh Spots. The Belly of the *Yellow Gurnard* was white, but under the lower Jaw was black. The Sides and Back were yellowiſh; but between the Belly and Sides there ran a blue ſtreak or liſt about a line and a half broad from the Head to the Tail; and a little higher on the Sides, there was a Chain of blue Spots the length of the Fiſh; for on the ſides of the Head I obſerved theſe blue Spots, only from the Eyes to the end of the *Roſtrum* the Spots were of a deep yellow Colour. There being therefore ſo much of blue and yellow over the greateſt part of the Body of this Fiſh, I have given it the Epithet of *Cæruleo-flaveſcens*; for, where the ground is blue the Spots are yellow, and where yellow the Spots are blue.

Tho, hitherto there ſeems a tolerable agreement between theſe two Fiſhes, yet in the Remarks I ſhall now add, the diſagreement will appear greater. For the *Yellow Gurnard* was without Scales, I therefore call it *Lævis.*

Lævis. The *Red Gurnard* had not only Scales on the Back, but likewiſe a Ridge of ſpiny Scales all along the Sides; as alſo of each ſide the Back Fins were placed the like ſpiny Ridges or Scales. But the Belly ſeemed almoſt ſmooth, and had but few Scales, and thoſe very fine; and indeed thoſe on the Back were much ſmaller than thoſe in moſt other Fiſhes. If Mr *Leewenhoek*'s Obſervation be true, that even the *Anguillous* Kind are Scaly, then the difference will not be ſo great, the one having *Membranulous* Scales, the other *Bony.* Or it may be our ſubject is an *intermediate Species* between the *Gurnard* Kind and ſome other.

And this I am the more apt to believe, becauſe, tho it has Gills of each ſide, yet it had not thoſe *Apertures* at the ſides of the Head that the *Red Gurnard* had, and is common to moſt Fiſhes but the *Cteaceous* Kind; but, like them, the *Yellow Gurnard* had two *Apertures*, or large *Foramina's* placed on the hinder part of the Head, an inch beyond the Eyes, at which it ſpouts out the Water. By blowing into theſe *holes* I extended the Cavities where the *Gills* lay; and obſerved that over theſe Cavities were placed a flat Bone, which by the Contraction of its Muſcles might ſerve to force the Water out, and perhaps is aſſiſted in this action by another looſe Bone that lyes over it, whoſe Edges are jagged or indented, as in the Figure: At which place in the *Red Gurnard* I obſerved a ſtrong ſharp Spine.

Theſe *Foramina* in the Head of this Fiſh is a thing ſo very remarkable, that it may be looked upon as a *Characteriſtick*; nor do I know at preſent with what other Fiſh to parallel it with: For the *Cetaceous* Kind, that have Spouts in their Heads, have not *Bronchiæ*, but *Lungs.* The better therefore to diſtinguiſh this Fiſh, I have added this particular to its name: And could wiſh, that, inſtead of thoſe ſilly Names that are given to moſt Fiſhes, others were found out, that might be more Expreſſive;

and that their *Claſſes* were ſo order'd by ſuch *ſpecifick* differences, that one might better know where to range them, as in a good perfection is now done in the *Vegitable* Kingdom, that is more numerous.

But to conclude, I obſerved the Eyes in the *Yellow Gurnard* were placed more on the top of the Head, and the Skin here covered almoſt half of them, like an *Eyelid*; which I did not obſerve in the *Red Gurnard* whoſe Eyes were placed more at the ſides of the Head. The Head likewiſe of the *Red Gurnard* was more protuberant, in the *Yellow*, flatter. The End of the *Roſtrum*, the Teeth and Tongue in both were exactly alike; only in the Palat of the *Yellow Gurnard* I obſerved two *Cartaligonous* Bones, whoſe edges were bended downwards from the Palat, and did ſerve, as I ſuppoſed, for the hooking in and ſtaying the Cartilage of the Tongue, when it makes a Compreſſion for the forcing out the Water by the *Foramina* of the Head: Which Contrivance I did not find in the *Red Gurnard*, not having the like occaſion for them.

This Fiſh being ſtale, I had not opportunity of diſſecting it, and obſerving the *Viſcera*: And ſhall only farther add, That the Gills had four Oſſeous *Radij* of each ſide. But of theſe more, if I happen to get another of this ſort.

VII. Problema Medicinæ Cultoribus ſolvendum proponit Guilielmus Cockburn, M. D. R. S. S.

Experientiâ conſtat quam diverſæ ſint medicamentorum Operationes pro Temperamentorum, Ætatum, ac ejuſdem ætatis diverſi ſtatûs varietate. Magis vero conſpicua ſunt Emeticorum & Purgantium opera: Adeo, ut quæ provectiores ætate quam leniſſimè purgant, Infantes obruant: quæ juſtâ Cathartici Doſe hodie propinamus, nimis vel minimè nos craſtino afficiunt die. Immo ad hanc omnem diverſitatem operantur Temperie ſolummodo differentibus.

Quum igitur tam invicta ſit ubiq; difficultas in debita Pharmacorum evacuantium doſe decernendâ; optandam eſſet, methodus quâ poſſimus eadem abſq; dubio adminiſtrare.

Methodum hanc apodeicticis expediit argumentis, ſimul & ſigillis occluſam præſidi noſtro commiſit.

Rogat tamen Medicos quoſlibet, quænam ſit illa vel ſimilis Methodus quâ ſine errore dirigamur; eorumque ſolutiones ad Cal. Mart. 1705-6 exportabit, quas poſtmodum cum ſuâ publicabit.

VIII. *Part of a Letter from* Dr David Krieg, *F. R. S. to the Publiſher, concerning* Cobalt, *and the Preparations of* Smalt *and* Arſenic.

I Spent about 8 weeks in my own Country, and my chiefeſt Buſineſs was to enquire for the Minerals found thereabout, and to obſerve their preparations. Firſt, I ſhall deſcribe the preparation of the blue *Colour*, called *Smaltum*, which is made of *Cobalt* or *Cadmia nativa*, becauſe it is not clearly deſcribed by any Author, as much as I know.

Now the *Cadmia* or *Cobalt* is a maſſie, heavy, grey ſhining Stone, found in a great quantity in the Mines about *Shneeberg*, and ſome other places of *Hermanduria*. It is very often mixed with Marcaſite, ſometimes with Silver and Copper Oar, yea, the Silver is (but ſeldom) pure in the Figure of Hair.

After they have pick'd out the *Cobalt*, and ſeparated it from the common Stone, they beat it to Powder by an Engine or Machine, commonly uſed in Mines (called a Poolwork.) By that Operation, the Water carries away the light ſtuff and Sand, leaving the heavieſt behind.

This Powder is afterwards put into a low and broad Furnace, made on purpoſe to ſeparate the Sulphur and Arſenick; where the Powder is ſpread all over, and the Fire, which is beneath and behind it, is forced to paſs its flame along over the Powder, and ſo to take along with it the Arſenick in form of a Smoak; which afterwards is receiv'd by a low Chimney, and out of that carried in a cloſe Channel made of Brick wall, of about 50 or more paces, where the Arſenick by the way ſticks to the Wall, in form of a White or Yellowiſh Powder. The ſame is taken out every 6 months and melted into whole pieces.

The *Cobalt* thus roaſted, and ſmoaking little more, being red hot, is taken out, cooled again and gathered for melting. Its *Colour* by that way of roaſting is turned a little more whitiſh.

When they have a mind to melt it, the Powder of the *Cobalt* is mixed with Pot Aſhes and Powder of White Flint Stones: The proportion of them is according to the goodneſs of the *Cobalt*, or as they will make the *Smalt* of a deep or paler colour: For Example, they take one part of Pot Aſhes, two parts of *Cobalt*, and 3 or 4 parts of Flint. This Mixture is put into great ſtrong Pots, ſtanding in a hot Furnace; 6 or 8 Pots in one Furnace; there it ſtands a melting for 5 or 6 hours time, turning into a blue Glaſs, which afterwards is taken out with a great Iron Spoon and put into a Veſſel full of cold Water, where it cracketh and grows more tender, to be the more eaſily powdered again: But the empty pot in the Furnace is filled up again with the aforeſaid mixture. And ſo they continue night and day, not leaving off the fire in the Furnace.

The blue Glaſs taken out of the Water is powdered again by the ordinary Engine; the fineſt, ſeparated by a Sieve, is put into a Mill, and grinded in Water into the fineſt Powder, which by waſhing is ſtill ſeparated from the Courſer.

The ſame is afterwards dryed in little and warm Chambers, put into Barrels, and thus ſent away to ſeveral Countries.

If one of the Melting Pots breaks, or is very much burnt, ſo that it muſt be taken out, there they find always on the bottom two Cakes of different ſtuff, not mixed with one another. The undermoſt is a ſort of *æs Caldarium* or (*Gleiken Spiſſe*) and the uppermoſt is of *Marcaſit.*

The Graſs and Fruits growing there about, where ſuch a Work-houſe ſtands, is commonly poiſoned by the Arſenical Smoak, that no Cattel or Men can without damage feed upon them.

Explication of the Figures, Tab. 4. concerning the making of Smalt.

Fig. 1, 2.

THe Furnace where the Cobalt is roaſted, and the the Arſenick ſeparated.

a The Furnace to roſt the Powder'd Cobalt.
b The Chimney accepting the Arſenical Smoak.
c. c. c. The Channel of Stones to collect the Arſenick.

Fig. 3.

The Furnace for melting the Cobalt into a Glaſs.
a a a a the holes where ſtand the Melting Pots.
The great holes, where they put in the Pots is ſhut up with Bricks, and a little one left, where they take out the Glaſs with the Spoon. b b b b.

Fig. 4.

2 Grinding Stones to Grind in Water.

Printed for *Sam Smith* and *Benj. Walford*, Printers to the Royal Society,
at the *Princes Arms* in *St Paul's* Church-yard, 1705.

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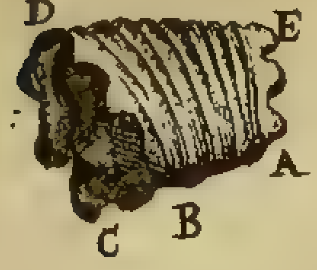

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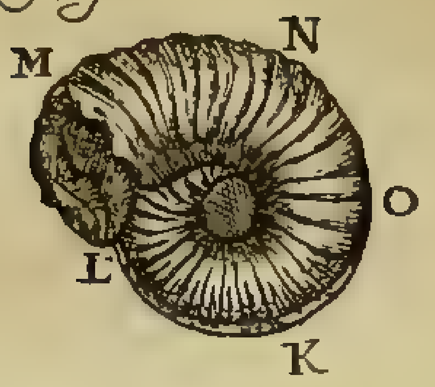

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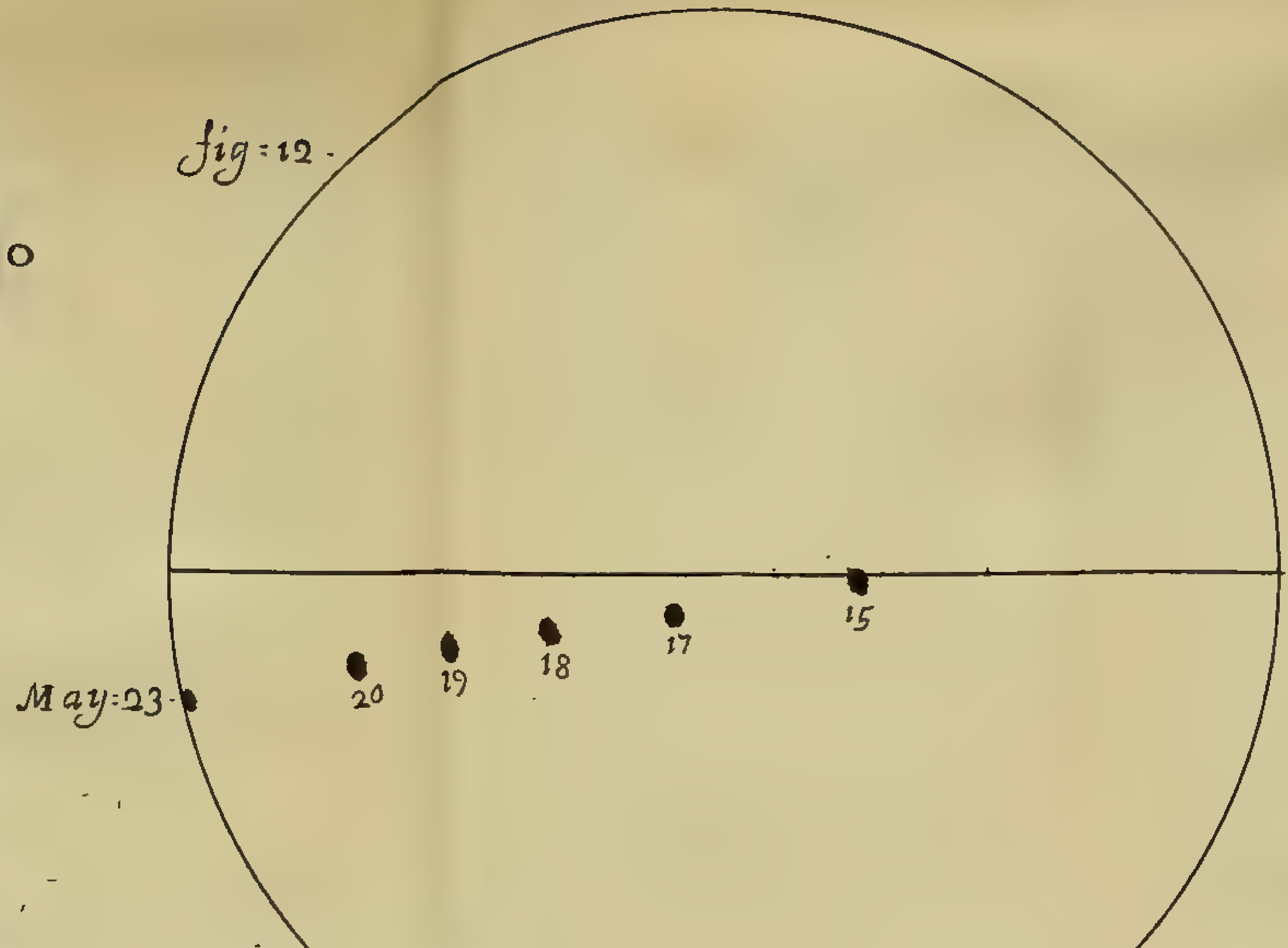

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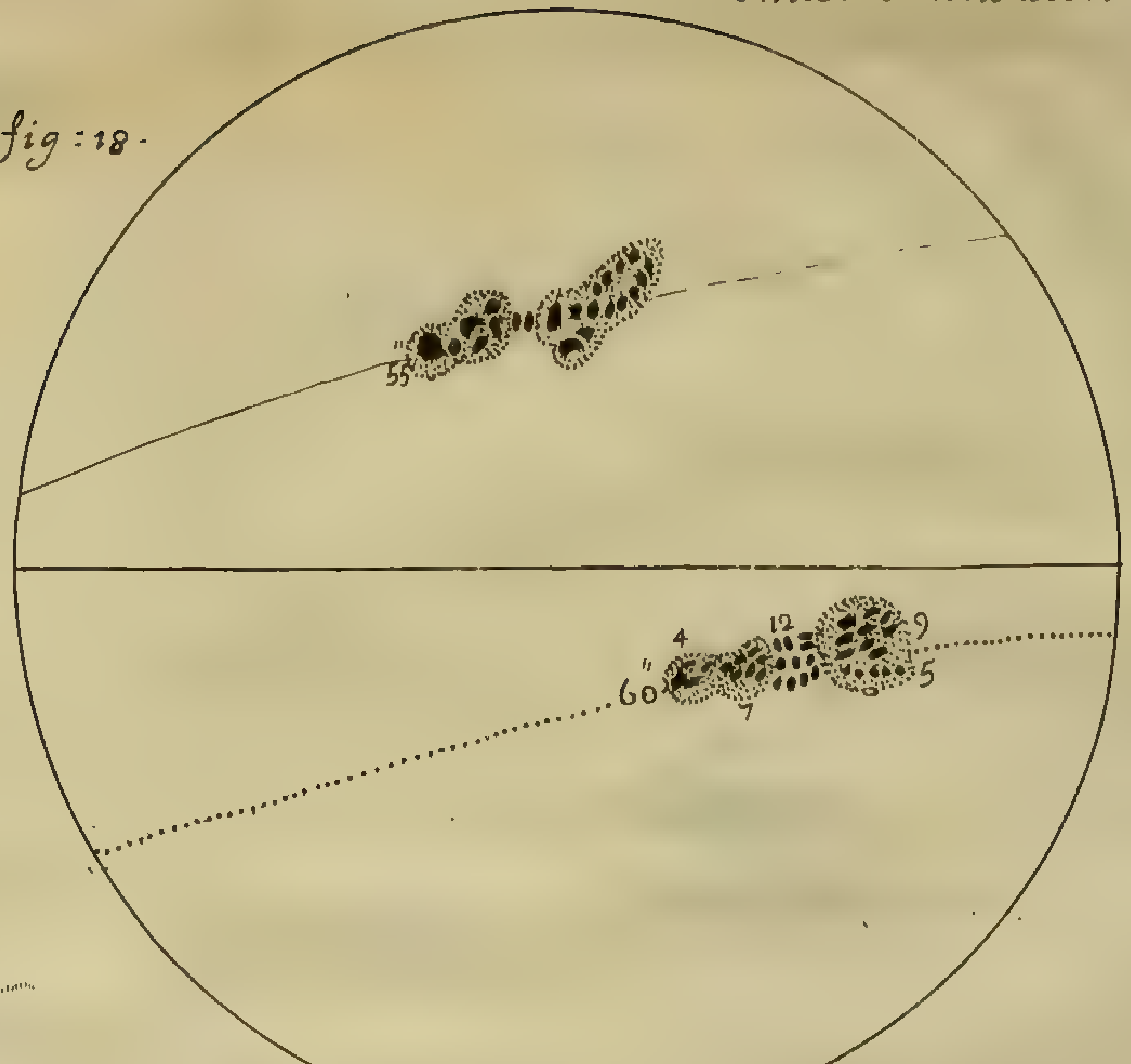

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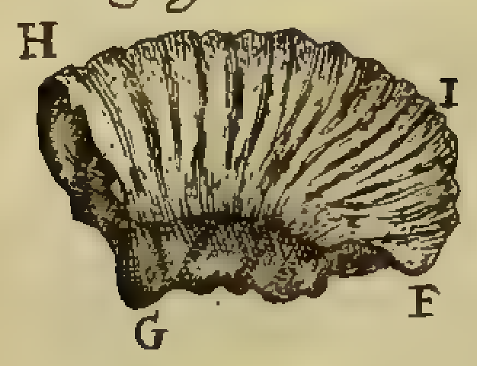

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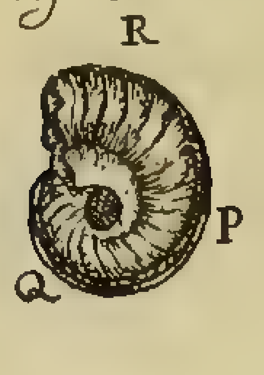

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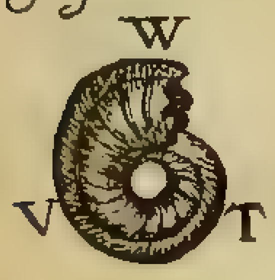

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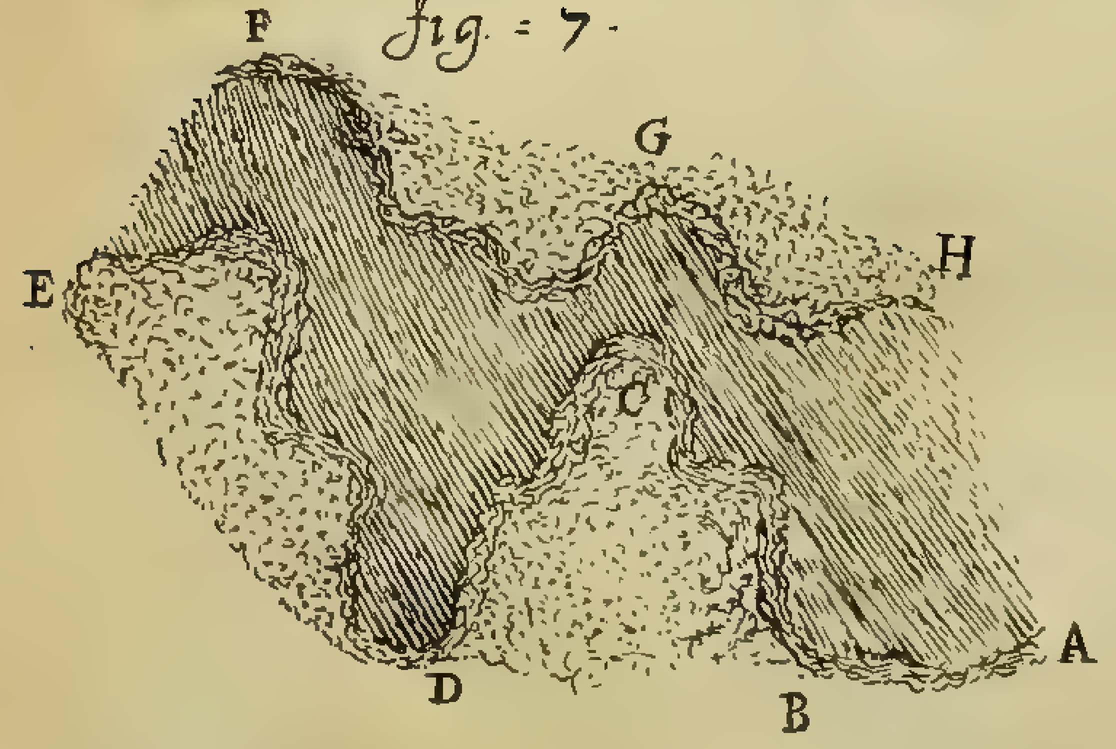

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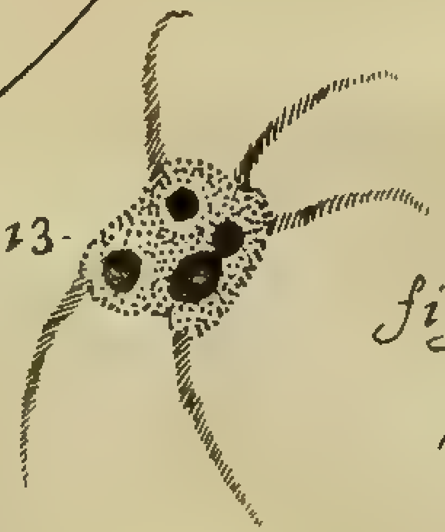

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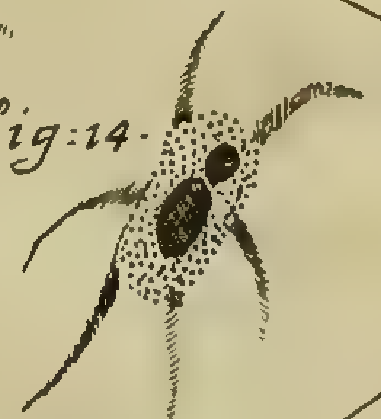

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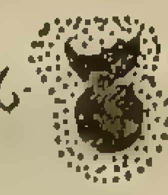

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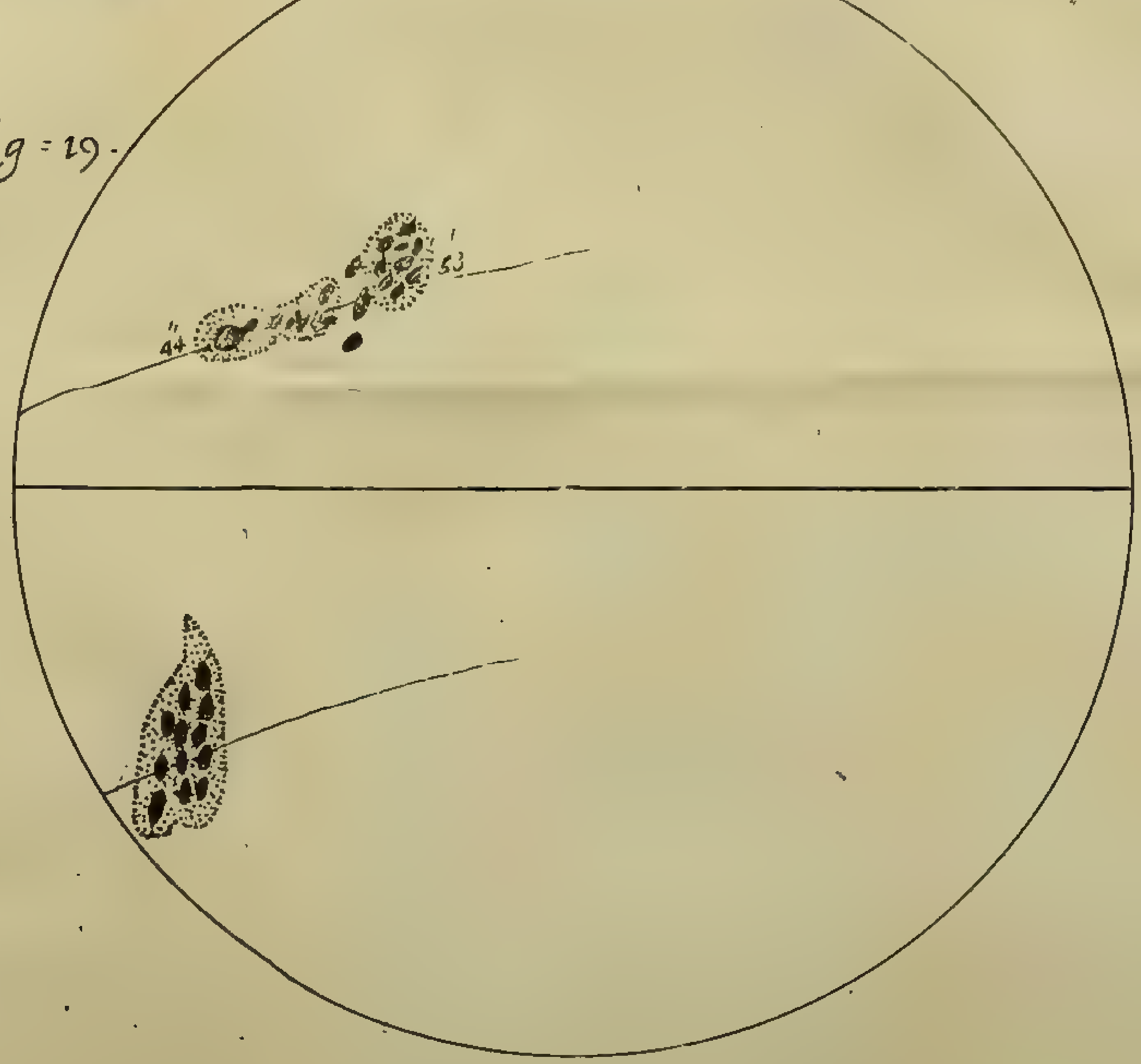

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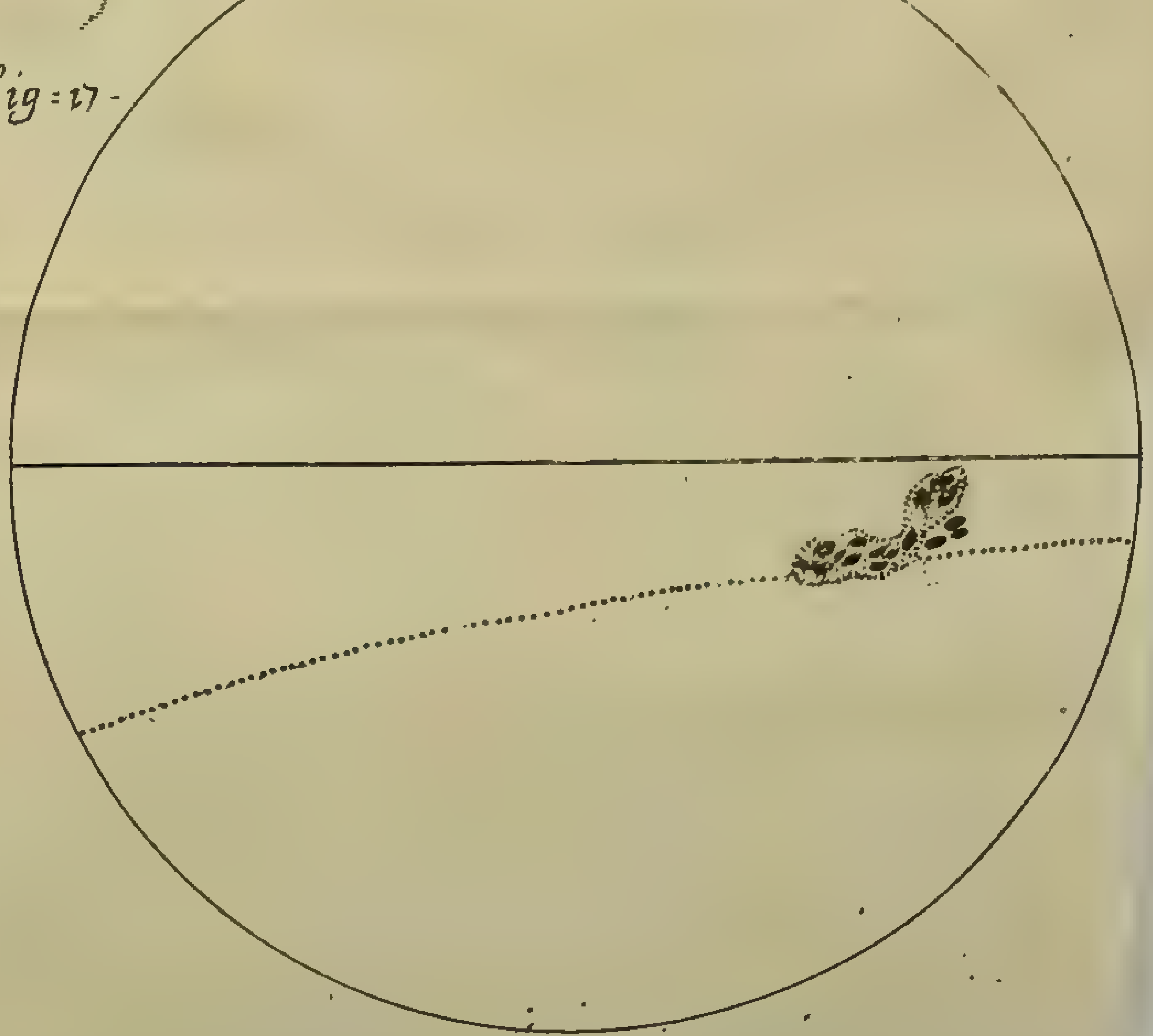

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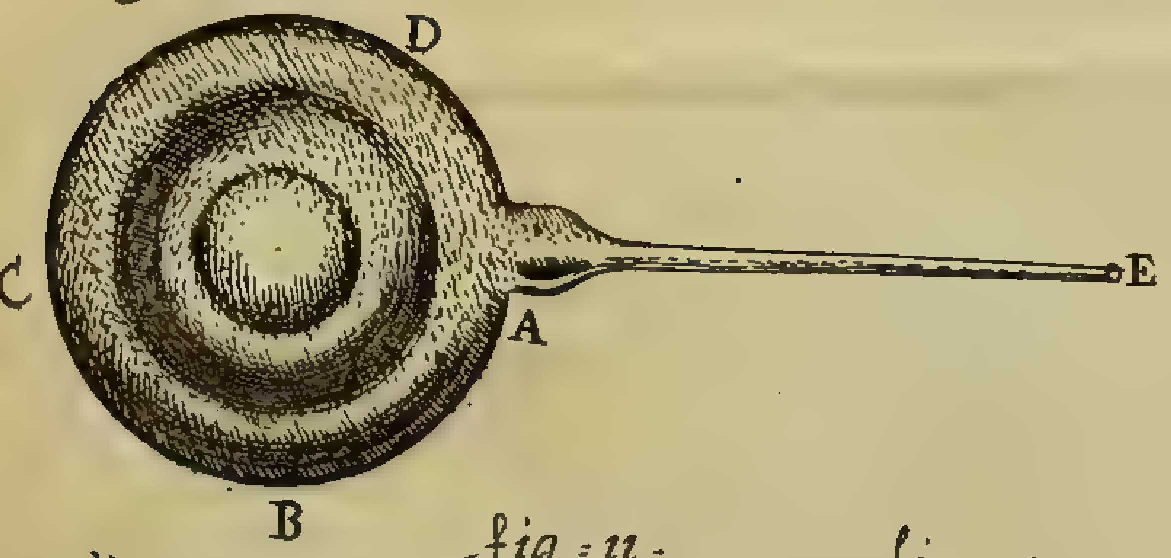

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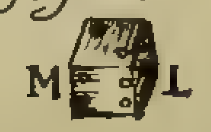

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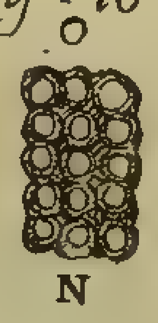

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PHILOSOPHICAL TRANSACTIONS.

For the Months of November *and* December, 1704.

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I. *Obſervations made by Captain* Stannyan *of the Spots that appear'd upon the Body of the Sun, in the Months of* May, June *and* July, *in the year* 1704. *Communicated by Mr* Hodgſon, *F. R. S.*

II. Georg. Joſeph. Camel. *De Plantis* Philippenſibus *Scandentibus*; *Pars 2da. Ad* Jacobum Petiver, *S. R. S. nuper tranſmiſſa.*

III. *A Letter from Mr* Antony Van Leuwenhoek, *F. R. S. Concerning ſome Foſſils of* Swiſſerland, &c.

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V. *An Account of a Book.*

Apicij Cœlij de Opſonijs & Condimentis ſive Arte Coquinariâ Libri Decem.

Cum Annotationibus Martini Liſter è Medicis Domeſticis Sereniſſimæ Majeſtatis Reginæ Annæ, & Varijs Lectionibus integris Humelbergij, Barthij, & Variorum.

I. *Obſervations made by Captain* Stannyan *of the Spots that appear'd upon the Body of the Sun in the Months of* May, June *and* July, *in the year* 1704. *Communicated by Mr* Hodgſon, *F. R. S.*

May the 15th. ON *Saturday*, *May* the 15th, 1703, As I was obſerving the Setting of the Sun, in order to Examine my Clocks, there appeared two Suns, the Mock Sun ſeemed above the Real one, which was then only five degrees above the Horizon. Whereupon I took a good Seven foot Telleſcope, with a ſmall Apperture, and ſoon diſcovered a Solar Spot near the Suns Center, which I deſigned to Obſerve more Exactly the day following, but it proved Cloudy.

May the 16th. *Sunday* no Sun ſhine.

May the 17th. *Monday*, *May* the 17th, At Six a Clock in the morning I took the ſame Telleſcope, armed with a Clouded Eye-glaſs, and immediately perceived that the Spot was advanced conſiderably towards the Suns Weſtern Limb; it ſeem'd of a ſtrong conſiſtence, very Compact, reſembling a Face, and was diſtant by Noon from the Anteriour Limb of the Sun's Diske 61 Seconds of time. See Fig. the 12th.

May the 18th. *Tueſday*, *May* the 18th, At noon I found the Spot diſtant from the Preceding Limb 46 Seconds of Time. Fig. the 12th.

May the 19th. *Wedneſday*, *May* the 19th, At Noon I obſerved the Solar Spot to be moved within 33 Seconds of time of his Weſtern Limb. Fig. the 12th.

Thurſ-

May the 20th.

Thurſday, *May* the 20th, At Noon the Spot was arrived within 21 Seconds of Time of the Preceding Limb, and moving nearly in a Straight line. Interſecting the Parallel of Declination paſſing through the Suns Center. Fig. the 12th.

May *the* 21*ſt*.

Friday, *May* the 21ſt, We had no Sun-ſhine.

May *the* 22*d*.

Saturday, *May* the 22d, At ſeven a Clock in the Morning I obſerved the Solar Spot was advanced very near the Limb of the Sun's Diske. Fig. the 12th.

May *the* 23*d*.

Sunday, *May* the 23d, At ſix in the Morning I ſaw the Spot, which by that time was gotten to the very Edge of the Sun's Diske, Reſembling a Barley Corn, lean and ſlender, and of a Duskiſh Colour, wanting only its own ſhorteſt Diameter of the Suns Limb. At Eight a Clock I obſerved it again: Alſo at Ten, and at Twelve. At Two I perceived it was ſlid into the very Circumference, and hardly Viſible, had I not had an Eye upon it all the day long. At Four I examined the Sun's Body with my Eighteen Foot Glaſs, which is a good one, but could not perceive the leaſt Glimpſe of it; ſo that about Three in the Afternoon it totally diſappeared. Fig. the 12th.

Obſervations of the Solar Spots in *June*.

June *the* 3*d*.

ON *Tueſday*, *June* the 3d, About ſix in the Evening I obſerved with my Eighteen Foot Glaſs four Spots in the Sun's Diske, environ'd with a Miſtineſs, thicker on the Right hand than on the Left, ſituated in the upper Left hand Quadrant, about the 12th part of the Sun's Diameter diſtant from his neareſt Limb. From the Cloud about them proceeded both ways five long curve Rays, of a yellower Colour than the Sun's Body. Theſe Spots I could never ſee more, though I watch'd them for ſeveral days together. Fig the 13th.

June *the 7th.* On *Monday, June* the 7th, A 1703. At three a Clock in the afternoon I diſcovered the ſame Spot (to my thinking) that I ſaw go off the Sun's Diske on *May* the 23d: Re-entring the Sun's Face juſt at the time and place that I expected it.

At four of the Clock, the Sun being extremely Clear, I mounted my Eighteen Foot Telleſcope, through which the Spot appeared diſtinct, but ſlender like a Spider, with an Eliptical Speckly miſt about it, and 5 or 6 Light coloured Streaks. It ſeem'd to me to be as it were divided near the Top, as in the Figure. Fig. the 14th.

June *the 8th.* *Tueſday, June* the 8th, At ſix this Morning the Spot was very Viſible, and I ſaw it trace again its former Path, coming in exactly where I expected; it kept its ſhape, but thoſe Lemon Coloured Streaks diſappeared, tho it ſelf and the Miſt about it grew bolder and broader viſibly, as it re-entred the Sun's Diske.

June *the 9th.* *Wedneſday, June* the 9th, At five of the Clock this Evening I obſerved the Spot with the 18 foot Glaſs, but could not perceive it had altered its ſhape, but advanc'd gradually over the Sun's Diske, as it had formerly done.

June *the 10th.* *Thurſday, June* the 10th, At noon the Sun ſhining very bright, I had an opportunity of being aſſured it was the ſame Spot, I plainly ſaw it move over its former Path, and was then diſtant from its neareſt Limb 29 ſeconds of Time. At five in the Evening I obſerved its ſhape (with my 18 foot Tube) to be altered, appearing bigger and blacker than ever, as in the Scheme, Fig. 15.

June *the 11th.* *Friday, June* the 11th was an ill day for Obſervations. But I had a ſight on't with the 18 foot Glaſs; it continued black and bold, as before.

June *the 12th.* *Saturday, June* the 12th, At 7 a Clock in the Morning, the Sun's Body being very Clear, I ſaw the Spot through the 18 foot Glaſs, retaining its former ſhape.

June the 13th.

Sunday, June the 13th, By this day noon the Spot was arrived at the ſame point of the Sun's Diske that I found it in on *Monday* at Noon, *May* the 17th; which makes me inclinable to believe it was the very ſame Spot.

June the 14th.

Monday, June the 14th, According to Rules received yeſterday from Mr *Flamſtead,* I meaſured the diſtance of the Spot from the next Limb of the Sun's Diske, which I found to be 45 ſeconds of Time from the Anteriour Edge of the Sun's Body: And upon *Tueſday, May* the eighteenth, it was obſerved to be in the very ſame place of its Path, within a ſingle ſecond of Time. At 4 I obſerved it with my 18 foot Glaſs, and perceived that it had altered its ſhape, appearing as at Number 14. I received it on the Scheme, and it was diſtant from the preceding Limb 612 ſuch parts as the Sun's Semidiameter is 900.

June the 15th.

Tueſday, June the 15th, At Noon the Solar Spot was diſtant 32 ſeconds of Time from the leading Limb of the Sun's Disk, and covered the very place where the ſame Spot had been obſerved on *Wedneſday* the nineteenth of *May.*

June the 16th.

Wedneſday, June the 16th, No Sun ſhine.

June the 17th.

Thurſday, June the 17th, No Sun-ſhine.

June the 18th.

Friday, June the 18th, At Noon I obſerved the Solar Spot waxing very ſlender, but notwithſtanding that it was black and bold to appearance, the Miſtineſs about it on the Right Hand perceivable, and that on the Left grown ſlender, in proportion with the Spot it ſelf, and found it diſtant 5 ſeconds of Time.

June the 19th.

Saturday, June the 19th, At 5 this Morning, it being Clear Weather, I ſaw the Spot diſtinctly with my 7 foot Tube: At 9 a Clock I mounted my 18 foot Glaſs, obſerving once in half an hour all the Morning: At 12 I perceived that all the Cloud or Miſty Matter that uſed to ſurround the Spot was inviſible, and the Spot it ſelf reduced to little or no breadth, in compariſon to what it had been towards the Suns Center, and ſo cloſe to the Limb of the Diske, that I could only perceive a ſmall ſtreak of the Sun's Light between it and the Limb of the Sun's Body ; at 2 a Clock I could juſt perceive it, but grown extremely ſlender.

The firſt Revolution I ſaw the Spot half in the Circumference of the Sun's Limb at 2 a Clock on *Sunday*, *May* the 23d: And the ſecond Revolution I juſt perceived it with the 18 foot Glaſs, at half an hour after two a Clock on *Saturday* the 19th day of *June.*

Obſervations of the Solar Spots ſeen in *June* and *July*, 1703.

June *the* 27*th* ON *Sunday*, *June* the 27th, about ſix a Clock in the Evening I obſerved ſeveral Spots in the Sun's Diske, but had not the Conveniency to uſe my longeſt Telleſcope, becauſe of ſome Trees that were in my way to Weſtward, ſo that I made no Obſervation till the *Tueſday* following.

June *the* 29*th.* *Tueſday*, *June* the 29th, About 7 in the Morning I counted 16 Remarkable Spots in the Sun's Body, and near his Center they appeared as in the Figure, through the 18 foot Glaſs ; then I took my ſeven Foot Telleſcope and Frame, and obſerved that the foremoſt Center of ſix that looked on the Paper as one ſpot, was diſtant from the Sun's Anteriour Limb 81 ſeconds of Time, and the laſt Cluſter 87.

This day the foremoſt Spot was diſtant from the following Limb, according to the Path of the Spot, juſt 55 ſeconds of Time. The Sun's Diameter was always 136 ſeconds in the Tranſit, and the Spot was 126 : So that that the Spots path was 10 ſeconds ſhorter than the Sun's Diameter.

June the 30th

Wedneſday, *June* the 30th, At eight a Clock this Morning, obſerving the Solar Spots with my 18 foot Telleſcope, I perceived very plain that they had wonderfully increaſed in Number, and ſtrangely changed their places. The Cluſter of ſeven Spots ſeem'd to me to move gradually, as the ſingle Solar Spot did in *May*, but the Cluſter 4 went too faſt forward, the 12 Spots without a Miſt about them ſtraggled all manner of ways, and the 9 Spots and the 5 black little ones went backward, and unbent itſelf at the ſame time as it were into a ſtraight line. I am apt to believe it went backward, as that the other went too faſt, or faſter than ordinary forward, for in 24 hours the foremoſt Cluſter advanced 21 ſeconds of Time, which is more by ſix ſeconds than ever the ſingle Spot moved in that time, even when neareſt the Sun's Center; and the diſtance in time between the firſt and the laſt Cluſter this day was greater by 3 ſeconds than the day before.

The foremoſt Cluſter of 4 Spots was diſtant from the advancing Limb of the Sun 60 ſeconds of Time.

At half an hour paſt 4 the advancing Cluſter paſs'd the interſection in 55 ſeconds of Time, after the Sun's foremoſt Limb had paſſed Conformable to the Spots path; and the laſt Spot paſſed in 63 ſeconds of Time, the laſt Limb paſſing the interſection, according to the Path of the Spot, in 126 ſeconds of Time, the Sun's largeſt Diameter paſſing in 136 ſeconds, the Spots by this time appeared ſtrangely black, and of very odd ſhapes, as in the upper part of the Circle.

July the 1st

Thurſday, *July* the 1ſt, At eight a Clock in the Morning I obſerved the Solar Spots with my eighteen foot Teleſcope, the Weather being good, and ſaw that they had rang'd themſelves in Reſpect of one another, as is Repreſented in the upper part of the Scheme: The leading and largeſt Spot being diſtant from the anteriour Limb 44 ſeconds of Time, the laſt Cluſter lying a little awry, paſs'd in 53 ſeconds: After the Anteriour Limb ſo done, the following Limb alſo paſs'd the Interſection, according to the path of the Spot, in 125 ſeconds of Time.

Friday, }
} No Sun-ſhine.
Saturday, }

July *the 4th.* *Sunday*, *July* the 4th, This Morning at eight a Clock the Leading Spot was diſtant from the advancing Limb 10' ſeconds of Time, the Spots and Cluſters retaining nearly the ſame ſhape, but beginning to Contract themſelves, the foremoſt methought look'd ſtrong enough to make another Revolution, and paſs'd in 127 ſeconds.

July *the 5th* *Monday*, *July* the 5th, At ſeven a Clock I found the Spots had quite alter'd their ſhape, appearing dull and ſlender, as in the lower part of the Scheme, and diſtant about four ſeconds, being all included in a Cloud.

July *the 6th.* *Tueſday*, *July* the 6th, At ten a Clock the Sun's Diske, view'd with my 18 foot Teleſcope, was found clear of all Spots.

On the ſeventeenth day of *July*, about four a Clock in the Afternoon I obſerv'd ſome Spots in the Sun's Body, reſembling thoſe I ſaw on *Thurſday* the third of *June*, only with this difference, that theſe appeared to me as if they had been heated red hot; they ſeem'd to be in the ſame part of the Sun's Diske. I obſerved them above an hour together that day, but could never afterwards ſet Eye on them, nor diſcover whether they were coming in, or going off his Viſible Diske. I continued to obſerve the Sun, as often as was poſſible, with my eighteen foot Glaſs, till the end of the Month, but without farther ſucceſs.

II. Georg. Joſeph. Camel. *De Plantis* Philippenſibus *Scandentibus*; *Pars 2da. Ad* Jacobum Petiver, *S. R. S. nuper tranſmiſſa.*

Sect. V. *De* Scandentibus *Folliculoſo-Siliquoſis.*

61. APocynum LUZONIS 1, *ſeu* Antipolanum. *Indis* Balana. Fructum fert formæ & magnitudinis habitioris *Mangæ*, ſpithameum, viridem, copioſiſſimè lacteſcentem, lacte candidiſſimo, ſpiſſo, nec viſcoſo. *Semen* compreſſum, magnitudine unguis digiti indicis, creberrimum, in oblongum glomum imbricatim congeſtum, flaveſcens, & unciâ longioribus, argenteis, & ſericeis caudatum floccellis. Ex altiſſima dejectum arbore habui Fructum. *Florem* & *Folia* obſervare non licuit.

62. Apocynum LUZON. alterum. Indis *Tugtungajas*, i. e. *Viperinum*, eò quod eo Serpentes virides ſpecialiter gaudeant; *Folia* gerit ſibi oppoſita, ferme palmaria, ſimilia folijs *Hingio*; *Fructum* orbicularem *Aurantio* parem latere uno fere digitum latâ criſtâ alatum, ex viridi & albo variegatum, edulem cum tener, uniforem ubi criſtatus, qui glomum continet *Seminis*, ſimilis ſemini *Balana* ſuper ſpongioſam matricem conglobati, in auras avolantis.

63. Apocynum LUZON. 3. Maycatenſe, *Viticulis* ſcandit creberrimis, vietis, geniculatis, lacteſcentibus. *Folia* promit *Hingio* ſimilia, *Tugtungajas* majora, ex viridi pallentia, *Florem* frequentem, pentapetalum, radiatim in binum corymbum, ceu umbellam congeſtum, graveolentem, flaventem. *Fructum* quadrangularem, tetraforem, viridem, ſpithameum, in mucronem deſinentem, conti-

nentem *Semen* ſquammatim congeſtum, latiuſculum, ſimile Semini *Balanæ*, ſed protenſioribus, argenteis, & pappoſis filamentis, *Cometæ* adinſtar caudatum.

Fig. 64. Apocynum LUZON. 4. Maragondonenſe. *Indis* Dugtungajhas i. e. *Colubrinum*, Hiſpan. *Palo conſuelda de la culebra*, alijs *Palo de la caveza*. Minimè autem *Ligni Colubrini* nomen adeptum eſt, quod Viperarum ſuccurrat morſibus ut *Manungal*, ſed quod Serpentes vulneratos hujus Plantæ folijs ſibi mederi obſervatum fuerit, unde *Indi* edocti, & folijs & lignoſorum ſarmentorum, quæ fere brachialia, ſcobe, ad conglutinanda vulnera recentia proſperrime utuntur. Hujus convolvuli lignoſi, ſarmenti materies albet, poroſa eſt & ſpongioſa, levis & inſipida. *Cortex* craſſus, ſtriatus, fiſſuris plurimis diductus, ſaporis ſubadſtringentis, *Liber* interior tenax & corticoſus. *Folia* ſibi oppoſita; villoſa, *Laurinis* latiora; *Radix* ſubdulcis: *Follicoſi* fructus ex ſubrotundo ventre in teretem & ferme ſpithameum abeunt mucronem, *Semine* referti mediocri, ut reliquæ *Apocynorum* ſpecies.

Fig. 65. Apocynum LUZON. 5. *Taytayenſe*. Indis *Hingi guag*, i. e. *Hingi Corvinum*. Pro *Flore* dat candidas ſtellas, odoris *Jaſmini*, in ramuſculorum ſummitatibus exeuntes, quibus ſuccedunt *Siliquæ* compreſſæ, ſcabie variegatæ, digito auriculari tenuiores, ſed ſæpius pedes duos longiores, pullæ, & ſemine pappo coronato repletæ: *Folia* pulchella, lætè virentia, ſena communiter uno in ramuſculo. Ipſa planta Fruticoſa eſt, longis flexibilibus, & lacte glutinoſo ſcatentibus virgultis ſcandens, & alijs ſuperſterni gaudens.

66. Apocynum LUZON. 6. ſeu *Hingiguag* Antipolanum. *Folia* communiter 4, opacè virentia, palmum longa, ſeſquiunciam lata, uno gerit in ramuſculo, ex quorum apicibus ex frequentibus ramulis, creberrimi *Flores* in *Siliquas* 12 aut 15 ſpithameis, ſenis aut pluribus orbicularibus ventribus gratioſè extuberantes, abeuntes: *Semen* parvum, appenſo pappo ut quinti. Tota Planta uberrimè viſcoſo gaudet lacte.

67. Apocynum LUZON. 7. ſeu *Piſcatorium* fluvij *Manilenſis* 1. Gratioſa & ſcandens eſt Planta, *Folia* emittit bina ac bina, uno longiori inhærentia pediculo, raro palmum longa, communiter uncialia & ſeſquiuncialia, nigro virentia, terſa, quæ maſticata primùm adverſi ſunt ſaporis, mox fauces potenter acredine vellicant. Contuſa cum alijs piſcationi deſerviunt medicæ. Ex medio connexionis foliorum, flagellum in ſummo triſidum, in foliola minima abiens procedit. Ad apices verò, uti & ad foliorum alas plures proveniunt *Floſculi*, qui ex 12 viridibus, craſſis, teretibus ſeu cylindricis componuntur *foliolis*, quorum umbilicum, flaveſcens globulus, ex minimis compilatus ſtaminibus, occupat; floſculi *Roſarum* mixtum *Cinamomi* ſuaviſſime reſpirant odorem. *Siliquæ* puſillæ ex tereti mucronatæ, unifores 12 aut pauciores in unum quaſi congeſti corymbum, *Semen* habentes parvum, oblongum. Provenit ubertim ad fluvii *Manilenſis* ripas à Horto *D. Quintero* villa *S. Petri* uſque. *Indi* Itmoitmohan *vocant*. Folijs contuſis utiliter perfricant *Lepam Caſcado*; ſuccus illitus tumefacit. Fig.

Fig. 68. Apocynum LUZON. 8. ſeu *Malatenſe*. *Folia* habet ſibi oppoſita, ſeſquiuncià longiora, ex rotundo oblonga, atrè virentia, in vietis & teretibus viticulis: *Florum* muſcoſorum, ramoſi & ſpithamei racemi una cum cauliculis ex atro purpurei ſunt. Seminis *Siliquæ* ſeſquiunciales, vix calamum ſcriptorium craſſæ, virides, ex tereti mucronatæ. *Semen* parvum, latiuſculum, niveâ comatum cæſarie. Fig.

69. Apocynum LUZON. 9. *Viticulis* attollitur ſcandendo teretibus copioſè lacteſcentibus & helvâ lanugine pubeſcentibus. *Folium* eſt hederaceum, amplius palmo uno, longum ſeſquipalmum, ſibi oppoſitum, per palmaria intervalla exiens, ſubaſperum: *Flos* parvus, pentapetalus, phæniceus, racematim cohærens. *Fructus* bini, ac bini, fere ſeſquipalmares, calamum Anſerinum craſſi, unifores, & ſub- Fig.

hirſuti lobuli. *Semen* longiuſculum, comatum floccellis ut reliquorum.

Fig. 70. Apocynum LUZON 10. *Indis* Dugtungaſas ut 2 & 4. *Folia* promit per ſeſquipalmaria intervalla bijuga, unâ cum pediculo ſpithamea, palmo latiora, glabra, & craſſiuſcula. *Flos* congeritur ad foliorum genicula ter trinus, aut crebrior, parvus, viridis, ſtellatus, cui ſeminis ſuccreſcunt *Siliquæ* palmares, aut longiores, quaſi ex binis calamo ſcriptorio craſſis in unam coaleſcentes, ſeu in ipſa conjunctura carinulatæ & fiſſiles. *Semen* viride ,longiuſculum, compreſſum, argenteo caudatum pappo.

Fig. 71. Apocynum LUZON. 11. *ſeu* Silanenſe. *Cauliculis* ſcandit rotundis; *Folijs* luxuriat pulchris, ſibi ex adverſo provenientibus, ſuccoſis craſſioribus, nervis ceu altius proſtantibus porcis concinnè exaratis, mucronatis, bipalmum longis, palmum latis. *Flos* ad foliorum exiens ſinus, in longiori pediculo, duodenus, in corymbum diſpoſitus, & majuſculus, eſtque monopetalus ceu campana,flaveſcens infernè ad plicas purpuraſcens, cujus labia quinis f tiſcurt hiatibus, in unum interim coactis, aut coaleſcentibus ſupernè marginibus. *Fructum* non obſervavi, *Lanigerum* ſuppono.

Fig. 72. Apocynum LUZON. 12. Macatenſe. *Folia* communiter 4 in uno ramuſculo, ex quorum apice *Flores* 5 aut 7. albi, ſtellati, mediocres, ad medium ut Flores *Borraginis* nigris ſtaminibus umbilicati.

Fig. 73. Apocynum LUZON. 13. Indis *Tibalau* ſeu *Piſcatorium* ſecundum. Scandens eſt Planta & lacteſcens, ut reliquæ. *Folia* mittit communiter 9 uno in ramuſculo, & hæc fere ſpithamea, uncias 2 lata, in mucrone deſinentia & nervis a medio in marginem rectè excurrentibus, & è regione oppoſitis exarata. Lenta, tractu contumacia, & lacteſcentia ſarmenta, piſcationi deſerviunt medicæ, cum folijs *ſeptimi*, *Camaeſæ*, & *Lactang fructu*, *Banulad*, *Burao*, *Tigao*, *Tuble* & *Culiſao*, &c. *Tibalau* vel *Tabal* lac venenatorum animalium morſibus medetur.

74. Apo-

Fig. 74. Apocynum LUZON. 14. Indis *Hingi*, *Hingib* & *Hingio*. Eſt unum ex magis uſualibus *Liguſtris*, cujus lenta, vieta & fractu reſiſtentia ſarmenta ad quævis occurrentia liganda deſerviunt. Volubilis eſt Planta, ſcandens, lacteſcens, magna, *folio* ſibi oppoſito, ſeſquipalmari, palmaris latitudinis, ſimili *Aſclepiadis* folio. Pro *Fructu* ſiliquæ lanigeræ.

75. Apocynum LUZON. 15. *Seu* Liguſtrum *Indorum* è celebrioribus 2, eſt *Bagungbung*, Calvigenſibus *Bacungbacung*, alijs *Hacnaiag*: Hujus *Sarmenta* precipuè expetuntur & adhibentur ad anfractuoſas, & labyrinthæas ſepes, ex *Cannis* paratas, deligandas, quoniam ſubmarina quaſi perennant, quas per maris littoralia longiùs excurrentes diſponunt ad *Piſces* fallendos. *Lac* internè exhibitum prægnantibus Abortum cauſat. *Liguſtris* adnumera & *Camagſa*, *Togtalag*, & *Sagacag*.

76. *Tubre*, *Tugle*, vel *Tugli* aut *Tuble*, aliis *Caſſli* Boholauis *ſcilicet*, Tanaguanenſibus *Topoc*. Ni fallor ſpecies eſt *Apocyni*, pro *Fructu* etenim mittit *Siliquas*, *ſemine* ſericeâ lanugine impletas. *Volvulus* eſt lacteſcens, piſcationi deſerviens medicæ, ſuâ acrimoniâ moleſtat ut *Radix* Camaæſæ, *Euphorbij* ſcilicet modo: *Lac* Oculis inſperſum excæcat. *Byſaiarum* Indi Sarmenta, quæ fere ſunt brachialia, ſuo adjiciunt oleo Polycreſto, *Haplas*.

Fig. 77. *Tubre* vel *Tugle* altera. *Folia* fert compoſita, communiter ex alijs 7, alternè provenientia: Particularia verò conjugatim, claudente ſeptimo ſeriem, ſunt autem ſeſquiunciam lata, palmum, ſeſquipalmum, & ampliùs longa.

78. *Tuguituguian* deobſtruens eſt, & inſignis vulneraria.

Fig. 79. Apocynum LUZON. 17. Seu *Arboribus* tantùm innaſcens 1. *Indis* Capalcapal. *Viſci* modo *Cannis*, & Arboribus vetuſtioribus, aut putridis innaſci ſolet. *Folia* communiter habet palmaria, digitum lata, obtuſa, craſſa ut *Sempervivum*, & his craſſiora, lævia, & copioſè lacteſcentia, ex oppoſito exeuntia, in teretibus viticulis, imo nonnunquam in plantâ luxuriante vitioſè folia palmum unum, aut ſeſquipalmum lata, & ſpithamâ magis, aut minus longa. *Floſculus* binus ac binus exit ad foliorum angulos, puſillus,

& candidus. *Semen* parvum plumoſâ cæſarie ornatum, in trigonis & folliculoſis ſiliquis.

80. Apocynum LUZON. 18. ſeu *Arboribus* innaſcens alterum. s. *Antipolanum.* *Folia* exerit unà cum pediculo ſpithamea, uncias trinas lata, craſſiuſcula, 4 ferè uno in ramulo, lacteſcentia. Planta tota lacteſcit, nec ſcandit ut reliquæ *Apocyni* ſpecies, ſed quaſi arboribus inſerta, in aliquot abit ramos, quorum apices in florigeram deſinunt umbellam ex 11 pluribus aut paucioribus floſculis conſtantem, qui formæ florum *Borraginis* ſunt, candidæ ſcilicet & pentapetalæ ſtellulæ, pallido limitatæ auro, uti & hamatâ umbicatæ coronâ. *Fructum* non vidi.

Fig. 81. Apocynum LUZON. 19. ſeu *Arboribus* innaſcens 3. Variè ſerpendo per arborum caudices, *radices* ijſdem inſertas agit ſat craſſas, & lignoſas. *Folia* formæ foliorum *Phyllitidis*, craſſa, exſucca, terſa, nervis carentia, excepto medium ſecante. *Flos* ex tubulo pentapetalus, coloris cinnabarini, in gratioſam congeſtus umbellam, trinus ſemper ex uno pendet calyculo, & crocatis ſtaminibus repletur.

Fig. 83. Apocynum LUZON. 20. *Liguſtri* loco deſervit *Indis*. *Folium* ſubrotundum, hederaceum, ſuccoſum, ſuave, conjugatum, ſplendens. *Flos* frequens in umbellâ, virens, pentapetalus, rotundifolius, inodorus. *Sarmenta* tenaciſſima & lenta.

Sect. VI. Scandentes *Bacciferæ* folio *bijugo*.

Fig. 83. *Periploca* 1. legitima & uſualis. *Candotay vel* Candotan *Indis*. Yerba del pedo & Yerba de la mierda *Hiſpanis*. Rependo & ſcandendo quæque vicina amplectitur, quibus ſeſe involvendo arctiſſimè innectitur. *Folia* habet *Aſclepiadis*, e regione oppoſita, palmaria, non lacteſcunt. *Flores*, in 4 e foliorum geniculis prodeuntibus, ſemper ter trinè ramoſis & longioribus pediculis; creberrimi, gratioſiſſimi, ex niveo purpuraſcentes, campanulati, c. oris crenatis, racematim congeruntur, quibus *Fructus* orbiculares, primùm virides, maturi rubentes, coronati, *Piſo* compares

ſuccedunt, *ſemine* referti. *Folia* ſtercus fœtidiſſimum olent, hinc *Stercorariam* vocant. Decoctum laudatur in *Uſus* Urinæ retentione, Vertigine, Febribus, & ad caſum ex alto, ad diſſolvendos ſcilicet ſanguinis concreti grumos, potum: Alij in enemate ad flatus diſcutiendos commendant. Alij in Urinæ retentione exinde balnea parant vaporoſa, magma pubi imponendo. *Wilhelmus ten Rhyne* Folia Stercoriaria & *Foelo do Pedo* vocat, & ad Lepram commendat.

84. *Periploca* ſeu *Candotay* altera. *Folijs* gaudet ſubrotundis, bijugis, palmaribus: *Flores* albi, ſtellati, in ramoſâ, ſeu ſemper in binos ſubdiviſâ ramulos, quaſi umbellâ. *Fructus* eſt bacca, mucronata, *Piſo* ſuppar, 5 folio caliculo. Fig.

85. *Periploca* s. Candotay 3. *Lianenſis.* Volvulus eſt lacteſcens, folij ſociati, anguſti, ſeſquipalmaris, unciam lati, craſſiuſculi, & ſubhirſuti. *Viticula* compreſſa ſunt, ſtriata, vieta, ſubhirſuta. *Uſus* foliorum ad flatus pellendos. Fig.

86. *Periploca* s. Candotay 4. Similis eſt 3, ſed *folio* hederaceo, palmum lato, & ſeſquipalmum longo, ex adverſo appenſo. *Radice* exiguâ, glumoſâ, s. grumoſâ, inæquali, & verrucoſâ, ut *Radix Scrophulariæ.* Fig.

87. Coliyat. *Volvulus* eſt maximus, *Prunifer*; *Folia* ferens, ſibi oppoſita, ſpithamea, ferme ſeſquipalmum lata. *Fructum* promit copioſiſſimum, in maximis racemis, binum ac binum ab uno pediculo hærentem, magnitudinis *ovi Columbini*, aut majorem, ex flavo rubentem, carnoſum, continentem *nucleum* formæ & magnitudinis glandis *Quercinæ*, edulem, ſaporis *Caſtaneæ*, ſi igne coctus fuerit. Abundat in montibus *Antipolo* & *Paynam.* Fig.

88. Smilax LUZON. aſper major, *Indis* Malaitmo. *Convolvulus* eſt magnus, *folio* rigido, nervoſo, & *Malabathri* folio majori, trinervio, & ſociato. *Fructus* ſunt acini, *Ceraſo* majores, lutei, carnoſi, amari, & in botrum congeſti, continentes binos, compreſſos, corneos, amaricantes, & aſperâ ac albâ cuticulâ intectos arillos. Fig.

89. Smilax LUZON. aſper alter. *Manambuc*, *Panamboc*, & *Yſipaſſin* Indis. *Volvulus* eſt cujus *Sarmenta* trium ſunt unciarum in diametro communiter, verò ferme verrucoſa ſunt, & craſſa, ut *Macabuhay*, & ſimiliter ſenectas deponunt, & exeunt Serpentum modo, ut illius. *Folium* nonniſi probè maſticatum, leviter morſicat, hederaceum eſt, *Betele* folio fere ſimile, ſed tenerum, & molle, alternè exiens, trinervium; *Fructus* ſunt oblongi, *Avellanâ* minores, virides, mox lutei, tandem corallini acini, in racemum cohærentes, & bini, aut trini ex uno pediculo: Mucagine, & unico, duriuſculo, aſpero, cujus medulla amara eſt, *oſſiculo* referti. Flos albus eſt, parvus, tripetalus in triungui calyce. *Radix* deforis flaveſcit, cortice eſt craſſo, & carnoſo, ut *Zarzaparilla*, & ut hæc longiſſimè prorepit, craſſa digitum, recenter eruta, & deguſtata ex levi amaritudine dulceſcit, mox acredine moleſtat.

Sect. VII. Scandentes *Bacciferæ* trifoliæ.

90. *Clematis* trifolia vulgaris. *Calitcalit*, *Gavilan* & *Panopol* Indis. *Folio* crenato, obſcurè virenti, & parte alterâ ſubhirſuto, & communiter trino alternè e viticulis prodeunte, vicinis ſuperinſternitur, & irretitur. *Flores* quadrifolij ſunt, & herbacei. Quibus *Baccæ* primùm virides, mox nigræ, ſucco morello plenæ, trinæ, ac trinæ cohærendo in corymbum ſuccedunt. Vulneraria, & conſolidans eſt, cujus folijs contuſis, & ſub cinere coctis, ſuccoque expreſſo, vulgus, & ad emollienda *Ulcera*, & ad mundificanda & conſolidanda rupta, & fracta, extirpandas *Lichenes*, & detergendam *Scabiem* utitur.

Fig.

91. *Clematis* incana. *Calitcalit maybula* Indis. Similis eſt vulgari, ſed ad tactum tota ſuavis, ob molliuſculum pilum, quo tota planta incaneſcit.

92. *Clematis* monſtruoſa, ſeu *Calitcalit* maxima. *Folia* gerit heptaphylla, glabra, & lætè virentia, majora quam ſint *Clematidis acetoſæ*: Flagella *ſeſquicubitalia*; Sarmenta *Viti Viniferæ* ſimilia, brachium craſſa; *Acinos* in corymbo, ut *Clematis vulgaris*.

93. *Oxyclematis* trifolia. *Calitcalit maſuca*, *Aiyo* Indis. Fig. Similis eſt priori, ſed *folijs* majoribus, quæ & pentaphylla evadunt, profundiùs inciſis, copioſiori, & acetoſo ſucco turgentibus, ad quorum nexus longiores protuberant *capreoli*, quibus fulcitur ſeſe innectendo. *Flores* quaſi in umbellâ, flaveſcentes, tetra-aut pentapetali, quorum umbilicum calyculus ventricoſus occupat. *Flores* in acinos abeunt, ut prioris, ſed majores. Planta vulneraria eſt & febrifuga.

94. Clematis *LUZON*. 3. ſeu Major, ſive *Vitis* ſylveſtris. Fig. *Indis* Bica & Malauva. *Planta* eſt ſcandens, trifolia, in quibuſdam *Viti Sylveſtri viniferæ* ſimilis, piloſa. *Folia* ſubrotundè crenata, ſeſqui palmum & longa & lata. *Botros* fert Magnos, *acinos* habiliores, aſperos, ſubdulces, nigros, aut etiam incarnatos ut *Silanij* vidi, fœtentes.

Sect. VIII. Scandentes *Bacciferæ*, folio alterno.

95. Vitis Sylveſtris *LUZON*. altera. *Bulacan* s. *Buracan limbahon*, i. e. folij rubri *Guiganenſibus*. an *Altragena* Theophraſti? *Volubilis*, ſcandens, & lacteſcens eſt planta, inter ſaxa ad fluviorum Margines provenire gaudens. *Sarmentis* eſt viticeis, rubris, quandoque dodrantem craſſis, *Foliis* Vitis vix non ſimilibus, infernè ſubhirſutis. Utuntur ex reciſo longiori ſarmento, aquoſo, & inſipido lacte, ad ℥4 pro doſi propinando, quod ſuaviſſimè & ſine ullâ moleſtia alvum ſubducit. Alij nihilominus alvum potenter deturbare ferunt, unde in colicâ, & animalium venenatorum morſibus commendant, imo & in paucâ quantitate exhibitum abortum cauſare, & fœtum mortuum expellere affirmant. *An* Bexucus *Peruanus* purgans *Godofredi le Brun*? quem *C. Cluſius* Atragenæ *Theophraſti* ſarmenta eſſe ſuſpicatur.

96. Bulacan *foliorum viridium*, ob vehementiam quâ operatur in uſum non venit; hujus ni fallor erunt effectus, fœtum pellere, & alia, quæ ſupra.

97. Vitis *LUZON*. ſylv. 3. *Ottonienſis*, Spontanea eſt Fig. & *Corinthiacæ* æmula. *Pampini* vix palmares, trilobati,

floſculi herbacei, pentapetali, *Uvæ* ut *Corinthiacæ*, in parvis racemis quaſi in umbellà.

Fig. 98. Alanguilang *ſcandens*, ſeu Hinlalagac. *Volvulus* eſt *fructùs* Roſei, acido-dulcis, tantillum piloſi, racemo appenſi. *Mariquinæ* exit.

Fig. 99. *Vitis Ulceraria*, Alexandri. *Planta* eſt ſcandens: *Folia* hederacea, trinervia, crenata, ſplendicantia, ſequipalmaria, quæ deguſtata quidpiam acidi ſapiunt, mox fauces morſicando vehementer exaſperant. *Flores* parvi, albi, tetrapetali. *Baccæ* Magnitudinis Pipêris & majores, in acumen abientes, ex adverſo foliorum racematim propendent. Magni æſtimant hanc plantam *Indi*, qui foliis contuſis emplaſtri modo in Ulceribus putridis, antiquis, manantibus, ſordidis, ſchirrhoſis, calloſis, fiſtuloſis & cancroſis utuntur, præcipuè verò in Ulceribus ſaucium in collutione. Abſceſſus præterea, & Apoſtemata emollit, & rumpit, ut *Alypaiong*.

Fig. 100. *Viticella*, Balagundugut *Indorum*. Perpuſillus, elegans, & gratioſſimus eſt *Volvulus*; folia incana, quinquenervia, alterna, corda effingentia; *Floſculi* minimi, albidi, muſcoſi, quaſi in corymbum coeunt; *Baccæ* lætè rubentes, qualia Sardois hærent Corallia ſaxis, piſo minores, foliorum congeriei imbricatim immixtæ, pulchellos concinnant racemulos.

Fig. 101. Malabanag. *Scandens* eſt Planta, habens *folia*; 5 nervia, alterna, ſimilia *Banag*, i.e. *Pſeudochinæ*. ex adverſo foliorum umbellæ *Florum*, inodorum, ex viridi flaveſcentium, hexaphyllorum, quibus *Baccæ* rubræ, parvæ, inſipidæ, lento glutine turgidæ, Piperi pares ſuccedunt. *Semen* parvus eſt *Phaſeolus*.

Fig. 102. Coccus volubilis, *Indis* Lobato, Libato, & Bredotali: *Hortenſis* & duplex montanus, *Naicenſis* & *Maiſilanus*. Hortenſis *Planta* eſt ſcandens, ſuccoſa, veſca, tenera, amans umbroſa & uda. *Viticuli* craſſi, teretes. *Folia* carnoſa, ampla, fere ſphærica, in mucronem vergentia, flaveſcentia, terſa, & nervis expertia, alternè appenſa. In ſummitatibus ramuſculorum e regione foliorum unciales, aut ſeſquiunciales racemuli, ſeſſilibus, coccineis, piſo paribus, ſuccoque chermeſino exuberantibus *baccis* onuſti, ſaporis nullius manifeſti. *Semen* orbiculare Coriandro minus. *Floſculi* calyculati, erubeſcentes. *Radix* coloris nativi, ſuccoſa, nodoſa, verrucoſa, & *ſcrophulariæ* modo multifariè inæqualis, & divaricata. Succum *Indi* ad caloris æſtum in Febribus attemperandum propinant. Veſcuntur folijs decoctis, & in acetarijs crudis. Ex *Baccis* ſyrupum paravi coloris coccinei, ad Julepos Febricitantium pulchro imbuendos colore perutilem.

103. *Coccus volubilis ſylveſtris.* Pariter edulis eſt; *Folia* tenera, ſucculenta ut *Portulacæ*, terſa, priori majora, ex atro virentia. *Folia* ſuppurationem adjuvant adimpoſita; Decoctum alvum emollet.

104. Cubebæ *Officinarum.* Plantam *Indi* Naple, Dalihupa & Buyonibun, i. e. *Betele Corvinum*, vocant. Hæc non ut *Betele* ſeu *Itmo*, *Mala-Itmo*, *Litlit* ac *Sabia* alijs inhærendo ſcandit, ſed vicinis ſeſe acclinando, ac ſuperinſternendo luxuriat, eſtque Planta amans umbroſa, crebrò ramoſa, *ramis* ſolidiuſculis, geniculatis nec vietis, ut reliquæ *Piperis* ſpecies, *folijs* obſcurè virentibus, parvis communiter, ſeſquiuncialibus, quinis fulcitis nervis, aromaticis. *Fructus* qui racematim propendet, maturus coloris eſt incarnati, *Semen* habens album, orbiculare, acriuſcule, aromaticum. Hæ *Baccæ* cum *Cluſij* deſcriptione collatæ, *legitimæ* ſunt *Cubebæ Officinarum.* Racemuli ſunt ſeſquipalmares. Fig.

105. *Piper* nigrum. *Hederæ* modo arboribus irrependo, & geniculis Sarmentorum (quæ brachio craſſiora) radiculas emittendo, & ſpecialiter Arbori *Dapdas* (ob molliuſculum & ſuccoſum corticem) innaſci gaudet & vitioſè luxuriat. Creſcit in *Leyte*, *Otton*, *Panay* & *Mindanao*. *Fructus* in racemis, acini maturi rubent. Piper *nigrum* ſunt acini virides collecti: *Album* ſunt acini maturi collecti, ſed unius plantæ fructus.

III. *A Letter from Mr* Antony Van Leuwenhoek, *F. R. S. Concerning ſome Foſſils of* Swiſſerland, &c.

Delft, *the* 13*th* Decemb. 1704.

LAſt *February* I imparted my Thoughts and Obſevations to the Learned and Famous Monſieur *Peter Valkenier*, Envoy from the *States General* to the *Swiſs Cantons*, about *Mountain-Criſtal*, and particularly that it was not produced from Ice, nor grew in the Mountains, where it has its Increaſe, as many are of opinion; but that it is coagulated of the Air, there where it is fixt in the Mountain, that Air and a little Moiſture is ſhut up in Cryſtals; the Parts of which being ſeparated, are again reſolved into Long Particles, of which a great many are Hexangular.

When the ſaid Gentleman return'd from *Swiſſerland*, I obſerved in his Houſe divers Shells of Fiſhes, and Snails, and other Rarities, which were Petrify'd, and a great many turn'd into Metal, with which he had fill'd a Cabinet; having made the Collection among the Mountains and Rocks of *Swiſſerland*. A few weeks ago Mr *Valkenier* did me the honour of a Viſit, and among other things, gave me four of the little Snail-ſhells that he had gather'd in the ſaid Mountains, where thro length of time they were chang'd into Metal, for they were extraordinary Heavy.

For my farther ſatisfaction, I took one of the Snail-ſhells, that I judged to be Metal, and beat it to pieces with a little Hammer; but finding that it broke very eaſily, I ſeparated the parts with the leſs trouble, and broke the fore-part of it with my Fingers, a ſmall part of which, repreſented by Fig. A B C D E, I placed before a Microſcope, of which B C D was what was joyn'd to the fore part of the Snail-ſhell, and wherein I obſerved ſix prominent Particles, and five others at A E; the which five were fitted or inſinuated into the ſix Particles; and how often ſoever I broke the ſaid Shell in pieces, I ſtill obſerved in the fore-part ſix, and in the hind-part five Particles, in the ſame order and diſpoſition; ſo that I fancy it muſt have been a Limb or Part of the incloſed Snail, and conſequently that it had been once a living Creature.

Having placed one of theſe little pieces of Snail-ſhell with the Break of the ſame before a Microſcope, I obſerved that the Matter within was compoſed of very ſmall ſhining Particles, which one would take to be broken pieces of Metal.

Foraſmuch as I have ſeen ſuch like ſeeming Particles of Metal, which was really nothing but Brimſtone, I took ſome of the little pieces of the Shell, and put 'em into a Glaſs, and then upon the Fire, and obſerv'd, that in proportion to the ſmalneſs of the Parts, a great deal of Water and Sulphur was drawn off of 'em, without diſcovering the leaſt ſign of Metal in the remaining Black Matter.

Moreover, I examin'd that little piece of Matter, which, as I ſaid before, I judged to have been the living Creature within the Shell; by its uncommon Weight it ſeem'd to be alſo turn'd into Metal, and the more when I had broken it to pieces, for then the manyfold exceeding ſmall ſhining Particles appear'd to be wholly Metallin.

The abovesaid Matter was extraordinary hard, inſomuch that when I ſtruck it againſt a Steel, as they do with a Flint ſtone, it yielded Sparks of Fire; I beat off a piece of it, and placed the remainder before a Microſcope, which ſhow'd itſelf as Fig. 2. F G H I, the Break of which

is

is repreſented by GH. On which ſide, the more one view'd it, the more ſhould one be perſwaded that the many ſmall ſhining Particles were certainly Metallin; but when I brought it to the Fire, and endeavour'd as much as I was able to keep the Smoak together, it appear'd plainly to me to be nothing but Sulphur, which was not only manifeſt by the ſmell of it, but that which was drawn off was of a yellow Colour, juſt as Sulphur appears to our naked Eye.

Now that Fig. 1. A B C D E is a part of a real Snail is clear to me, but how, and after what manner the Sulphur gets into the Horn, we can only gueſs. My opinion of the matter is this: The Snails and other things that are found upon the Mountains of *Swiſſerland*, and which are ſuppoſed to be changed into Metals, have lain, and do ſtill lye where a great quantity of Sulphur is ſhut up in the Bowels of the Earth; and that Sulphur, by a Subterraneous Heat or Warmth being render'd Fluid, mounts upwards in exceeding fine Particles like Fire, and ſo inſinuates itſelf not only into the inmoſt parts of the Snail-ſhell, where, according to all appearance, the Snail itſelf is almoſt conſumed, but alſo into the Pores of the Horn or Shell, and is there fixt and coagulated, ſo that the whole Snail is converted into a Sulphureous Subſtance.

This may ſeem ſtrange to ſome people, but thoſe that have dealt in Sulphur, and know into what an unſpeakable great number of ſmall parts it can be divided by Fire, they can eaſily conceive into what a number of Bodies, Sulphur, being put into a Fluid Motion, can inſinuate itſelf in ſome Ages; for, according to the opinion of the Learned Mr ......, as I have been inform'd, theſe Snails, and other Teſtaceous Animals, which are found in the High Mountains of *Swiſſerland*, have lain there ever ſince the Deluge; and ſo many of them by length of time are turned into Metal; or rather, according to my Hypotheſis, are moſtly Sulphur.

Now, in order to ſet before my own Eyes anew the exceeding ſmall Particles into which Sulphur is divided by Fire, I prepar'd a little Glaſs Globe repreſented by Fig. 3. A B C D, and placed in it at B, a ſmall particle of Sulphur about the bigneſs of a ſingle Corn of Sand; and when the Glaſs and the Air within it was ſo Temperate as to agree with the Air we commonly breathe in, I ſeal'd that part of the Glaſs which was open at E Hermetically, and then blow'd the Flame of a Candle upon the other part of the Glaſs where the Sulphur lay, till it evaporated into Smoak, which Smoak for a ſmall ſpace of time was carried about the Glaſs in a Circular Motion; and after that the Sulphureous Smoak ſubſided, and ſettled it ſelf on the Glaſs, I examin'd it with a Microſcope, and obſerved ſo many exceeding fine Particles on the ſides of the Glaſs, that no man ſcarce could believe that ſuch a ſmall grain of Sulphur could poſſibly be divided into ſo many parts; inſomuch that the ſmalleſt Globules of this divided Sulphur could hardly be ſeen with one of my beſt Glaſſes, and the largeſt Globules lay round about the Sulphureous Matter that was not quite diſſolved.

I let the Glaſs Sphere lye ſtill about half an hour, and then view'd it anew, and obſerved with wonder that ſome of the ſmall Globules of Sulphur, that lay a little remote from the reſt, form'd themſelves into a right line, and that 4 or 5 were placed lengthwiſe, and ſome Globules were ſo extended in length, that they toucht one another; but ſome hours after they were all united, and ſo compoſed one little body juſt like Salt-petre, when being joyn'd to Water, it begins to coagulate.

This Inclination or Coagulation was wonderful to me; and the more, becauſe ſome of theſe Coagulations were twice, others three times as long as ſome others that lay thereabout; and juſt by theſe coagulated long Particles lay other Sulphureous Particles, but none very ſmall.

'Tis

'Tis true, we ſee daily in Fluid Subſtances, thro' a Secret Inclination, that Homogeneous Particles coagulate together, but how the Particles of Sulphur, that are as it were glew'd down to the Glaſs, ſhould aſſemble and unite in one body, is very wonderful to behold.

I had one Snail-ſhell, repreſented here by Fig. 4. K L M N O, which was extraordinary heavy in proportion to its bigneſs, and which ſeem'd to me not to be quite whole, but that ſome part of it was broken off, as at L M.

I endeavour'd to break this Shell to pieces with my Fingers, but was not able, wherefore I laid it upon ſome Lead, and ſo broke it to pieces.

I wanted no Microſcope to view theſe broken pieces, which ſeem'd to be full, excepting the ſlendereſt part of the Tail, with a pale yellowiſh ſubſtance, that was viſible enough to the naked Eye.

To ſatisfie my ſelf about the ſaid appearing Metallin Particles, I put about a fourth part of the laſt mention'd Snail-ſhell into a Glaſs, and brought it to ſuch a ſtrong Fire, that the Glaſs was upon the melting; in doing which, I ſeparated a great deal of Sulphur (in proportion) from it, and when I took the remaining Matter out of the Glaſs, I ſaw that all the Sulphur was not extracted from it, for I diſcovered ſeveral Sulphureous Particles lying in the remaining Matter, which one would take for a black burnt Earth; and they were divided from each other in longiſh Particles, each of 'em having diſtinct Figures, agreeable to the places which they were to fill.

I ſeal'd up hermetically the Glaſs wherein the extracted Sulphur was coagulated, to the end that no Moiſtneſs or Vapours ſhould get into it, nor none come out, and then I view'd thoſe Sulphureous Particles that had lain fartheſt from the Fire, and ſaw that the Glaſs (tho' nothing thereof was perceptible to the naked Eye) was cover'd with Globules, juſt as if one had ſpread a Table all over with Sand ; and when I view'd the ſame a little while after, I ſaw the ſmall Particles were coagulated together in irregular Figures ; and as I did imagine before, that the ſmall Sulphureous Particles were faſtned to the Glaſs, now I ſaw an Oleagenous and Watry Subſtance, which one might call the Spirit of Sulphur, drawn off together with the Sulphur, and that ſeveral places in the Glaſs were without the Globules, and nothing but ſome of this Oleagenous Matter to be ſeen.

I had alſo a third Snail-ſhell, whoſe outmoſt part, or Shell, was as ſmooth as if it had been Poliſht ; and when I lookt upon it thro a Microſcope, I obſerved that the Horn or Shell had been adorn'd with wonderful Figures ; from which ſight I concluded that the Glance, or ſmoothneſs of the Shell was occaſion'd by the long and frequent Attrition of the ſame againſt other hard Bodies, before it could get any Reſt in the High Mountains ; as we ſee in hard Stones that are found on the Sea ſhore, which by the frequent Motion of the Waves or Sand about 'em, become very ſmooth and poliſht ; and 'twas by ſuch Motion that the fine Figures in the Shells are quite worn out.

This Shell deſcribed by Fig. 5. PQR I could break very eaſily with my Fingers, and with my naked Eye diſcover that it was for the moſt part compoſed of the abovemention'd ſhining Matter, as it was alſo for the moſt part full of Sulphur.

I had another Snail-ſhell, repreſented by Fig. 6. TVW, which was alſo very ſmooth, and when I broke that Shell in pieces, that which ſeem'd to be ſo ſmooth to the naked Eye, appear'd now with as many ſcratches as if it had been rubb'd with ſharp Sand ; and this was adorn'd with Figures too that were not diſcernable with the naked Eye ; a ſmall part of which is here deſcribed by Fig. 7.

A B C D E F G H, which was raiſed a little above the other part of the Shell, and ſome part lower, as B C D.

The abovemention'd Monſieur *Valkenier* put into my hands a little Body, whoſe form or ſhape is repreſented in Fig. 8. X Y Z, which is alſo found on the high Mountains of *Swiſſerland*, which ſeeming to the Eye to conſiſt of three Joynts, I endeavour'd to ſeparate 'em from one another, in order to diſcover, if poſſible, the internal figure of it; and tho I attempted to cleave it thro in the joynted parts with a ſharp Steel, I could not compaſs it, but broke it into irregular pieces, all which were ſo ſmooth and ſhining within, that the like never occurr'd in any common Stone; and it was moreover more than ordinary hard; the beſt judgment I could make of it was, that it was compos'd of flat parts.

I laid the biggeſt piece of it upon Wood coal, and brought it leiſurely into a ſtrong glowing heat; in doing which, at firſt ſome Splinters of it burſt away, and I could not perceive that there was any Sulphur in it; whereupon I dropt it into a ſmall Copper Veſſel in which there was not above a Thimbleful of Water, to ſee whether that would ſeparate the Parts, in order to diſcover the Homogeneous Parts the better; but inſtead of doing ſo, it divided into a vaſt number of unſpeakably ſmall white Particles, to which one may give the name of a Chalky ſubſtance.

As ſoon as this Chalky Matter was ſeparated, I obſerved a Film or Scum upon the Water, which I took to be the Coagulated Salts thereof.

I took a little of the ſaid Water from under the Scum, and poured it upon a clean Glaſs, and viewing it preſently after, I diſcover'd, to my great Amazement, ſo many Clear and Tranſparent Salt-particles (many of which were ſo fine and ſlender, that they ſeem'd to have but one Circle or Circumference) and of ſo various and different figures, that I believe no Painter, tho' his fancy were never ſo fruitful, could invent ſuch a number of Figures, or trace them upon Paper, as I there ſaw; and they were ſo very ſmall, that ſeveral Thouſands of 'em together could not equal the magnitude of a ſingle grain of Sand; and foraſmuch as a very great many of 'em were long, I fancy'd to my ſelf that that Figure might be peculiar to them, and that all the reſt had only aſſumed a borrowed form, which might be determined by the different manner of their uniting or coagulating in ſeveral places.

I let the Water ſtand upon the ſo called Chalky Subſtance a few days till it was all evaporated, and then I diſcovered a great number of very ſmall ſhining Particles lying at the bottom of the Copper-Veſſel, into which I had put the ſaid matter; all which I took out as clear as I could, and placed them on three ſeveral clean Glaſſes, and then viewing 'em with a Microſcope, my wonder was much greater, for I did not only obſerve ſo very different Figures, that no two of 'em were like each other, but they were all of them as clear and bright as Cryſtal, yea, ſome of them had as fine and regular points as a wrought Diamond, tho' above a thouſand times ſmaller than a courſe Sand.

Among others, there appeared to me ſuch a Triple-jointed Body as is deſcribed by Fig. 8. X Y Z, which I alſo endeavoured to ſeparate by its Joynts, but I could not ſucceed in this neither.

I laid this too upon a Wood Coal to make it glowing hot, as I had done the other, but a good part of it burſt away when it was but juſt warm, and as it began to be hotter, it made ſuch a buſtle, that if I had proceeded farther, I ſhould have kept none of it; whereupon I took a Glaſs Tube above a hands breadth long, and hermetically ſealed at one end, into which I put what remained of the above-mentioned Figure, and then heating that end of the Tube, the ſaid Matter burſt with great violence into ſuch ſmall Particles, that many of them ſeemed as fine as Meal or Flower, and if I had not ſtopt the open end of the Tube with my finger, moſt of this diſſolved Matter would have forced its way out from thence.

Afterwards I put the ſaid Tube into a glowing Heat, and then obſerved that a great deal of thin Watry Vapours were extracted from the reſt of the aforementioned ſubſtance.

I viewed the ſmall Particles that were in the inſide of the Glaſs, and I ſaw a great many very thin Scales, ſome of 'em having right Angles, and all of 'em ſeem'd to be compos'd of ſuch ſmall Particles, as fine Sand ſeems to be, to the naked Eye.

I took the aforementioned Matter out of the Glaſs Tube, and placed it upon a Wood-Coal, in order to put it into a greater Heat, but as ſoon as I had put it on the Fire, the ſmall Particles flew away ſo faſt, that I was forced to put it into the Tube again; and after having made it red hot, I poured it out of the Tube into the Water, but the Heat was not ſo great as to make it turn into a Chalky Subſtance, excepting a little piece no bigger than a Pins head, which I heated again without burſting or breaking, and dropping it into the Water it diſſolved into a Chalky Subſtance.

I had ſeveral ſuch like Particles but much ſmaller, and conſiſting of five Joynts or Ribs, which were alſo found upon the Mountains of *Switzerland*. This Particle, which is deſcribed by Fig. 9. I K, I ſlit thro the Joynts, but I could not do it ſo nicely, but that a ſmall piece of another Joynt ſtuck to the biggeſt; ſo that I could not ſo perfectly diſcover the Roſe-like figure, as it is repreſented by I.

I laid theſe ſlit Particles alſo upon Wood-Coal, intending to heat them leiſurely, but they made ſuch a buſtle upon the Fire, that in caſe I had proceeded, there had been none left upon the Coals; wherefore I put them likewiſe into a Glaſs Tube, as I had done before, but without any other ſucceſs, tho I held the Tube and the abovemention'd Matter in it, firſt in the flame of a Candle, that it might be leiſurely heated, and by this means it was ſo diſſolv'd, that it ſeem'd nothing but a Powder, and in this Operation there was alſo ſome moiſture exhaled.

From this wonderful Burſting, and that in ſuch ſmall pieces, I could conclude nothing elſe, but that a great many Watery Particles were ſhut up in this ſame Matter, and that theſe Particles were ſo ſtrongly united, and were moreover of ſo tenacious a ſubſtance, that it did not admit of the leaſt Evaporation of Moiſture; and theſe Watery Particles being rarify'd by Heat, demanded more ſpace, and ſo occaſion'd the Burſting of the aboveſaid Matter.

I ſet the ſaid Tube with the Powder in it over ſo violent a Heat that it was ready to melt, and immediately thereupon pour'd the Powder into Water, but it did not turn to a Chalky ſubſtance; and afterwards decanting the Water into a Clean Glaſs-Tube, I obſerv'd it to be impregnated with Salt particles,

In doing this I ſaw a great number of exceeding thin Particles like Fig. 9. I K, upon the ſides of the Glaſs, and thoſe that were the thinneſt appear'd now juſt as the ſmall Holes on the outſide of a Thimble do to the naked Eye.

I placed ſeveral of the ſmall Splinters that burſt in the Fire before a Microſcope, and order'd my Painter to draw that of which he had the cleareſt view, as you may ſee by Fig. 10. N O.

This Splinter was ſo narrow, that it had but three Rows of little Holes, which were all three no broader than the Hair of one's Head; and in ſome other Splinters the Holes were yet ſmaller.

From theſe Diſcoveries, I conſider'd with my ſelf, whether there had not been ſome Matter ſhut up in each of theſe Holes, which being rarify'd by the Heat, demanded a greater ſpace to contain them; but being all faſt ſhut up, and having no paſſage through the Pores, was the cauſe of thoſe Bodies deſcrib'd by Fig. 9. I K, to burſt into ſo many thouſand pieces.

Now if we reflect on the wonderful Compoſition of the laſt nam'd Figure, and the infinite number of Salt Particles ſhut up within it, and the various figures of the Salts that were extracted from Fig. 8. we muſt lay our Fingers on our Mouths and cry out, O the Depth of theſe Secrets.

The abovemention'd Gentleman gave me, amongſt other things, two little Dice, of the bigneſs that is deſcrib'd by Fig. 11, L M, adding, that ſome people ſaid they were Stone, others Bone; and that theſe Dice were found in *Swiſſerland* deep under Ground, and in great numbers in a place, where formerly there had been a *Roman* Camp; and that the opinion of the *Swiſſers* was, that the *Roman* Souldiers had made uſe of 'em in play, whilſt they were encampt there.

I view'd a part of one of theſe Dice, and ſtruck ſeveral blows with a Hammer upon it, which indeed made Holes in it, but without breaking it; whereas if it had been Stone, it could not have withſtood ſo many blows; at laſt, having cut off ſome ſmall bits, and made 'em glowing hot in the Fire, I obſerv'd that it was black as Bone is, when it has not lain long in the Fire, and white when it lay longer. In my laſt viewing of it, I was ſtill the more confirm'd that it was Bone, for I could then diſcover the Pores of a Bone in it; yet, in my opinion, it could not be made of the Bone of an Ox, becauſe the Parts were ſmaller.

IV. *Experiments about the Motion of Pendulums* in Vacuo. *By the Reverend Mr.* W. Derham, *F. R. S.*

I Have long deſired to know, whether there be any, or what Difference, between the *Vibration of Pendulums in Vacuo*, and the *Air*. And therefore have divers times recommended the Experiment to many ingenious perſons, who had better opportunities of trying it than I. And at laſt, having ſeen *Mr Hawkesbee*'s Experiments in his Pneumatick Engines ſhewn before the R. Society, I accompliſh'd my deſire, by recommending the Experiment to him; who readily undertook it. And having provided himſelf with a proper Receiver, and all other things neceſſary, he, with a Friend of mine in *London*, made the Experiment. The Movements he tryed with were an Eight day Clock vibrating ſeconds; and an Half-ſeconds Movement of mine, which I ſhall ſpeak more of preſently. The iſſue of their Experiment was, My Pendulum vibrated two tenths of an Inch on each ſide farther *in Vacuo*, than it did in the Free Air, and went 7 ſeconds ſlower in 20 minutes, than the other Movement. But in the open Air, my Pendulum in 20 minutes, went only 3 $\frac{1}{2}$ ſeconds ſlower than the other Pendulum.

This Experiment (although I diſtruſted neither the Skill, or Fidelity of the Experimenters) I was deſirous to try over my ſelf. And by *Mr Hawkesbee*'s generous kindneſs, in lending me one of his *Air-Pumps* (which I ſhall always gratefully acknowledge) I was ſoon furniſhed with proper Inſtruments. Which I ſhall give ſome account of, that others may judge how far the Experiment may be relied on, or that it may be better tryed, if mine be found defective.

The firſt Inſtrument was an *Air-Pump* of *Mr Hawkesbee*'s, a perſon meritoriouſly known to the R. Society, who I doubt not is the beſt Maker of thoſe kinds of Inſtruments in the World; and his Air-Pumps exceed others in the Eaſe of being pumped, and in the Certainty of their Evacuation; which may be known to a great nicety.

The next Inſtrument was the aforeſaid *Small Movement*, with a Pendulum of about 10 inches, that vibrateth *Half-ſeconds*, and is driven by the Power of a Spring. This Inſtrument I thought commodious, not only for being eaſily fitted with a Receiver, but alſo for vibrating Half-ſeconds very nicely, and alſo becauſe its Vibrations are equal, not ſome large, ſome ſhorter.

The laſt Inſtrument was a very well regulated *Month-piece*, that vibrateth *Seconds* all the Year, with as much exactneſs as moſt do.

Being thus accoutered, the Reſult of many repeated Experiments, day after day, was, That (as before) *in Vacuo* the Vibrations were always larger, than in the Receiver unexhauſted. At the firſt, when my little Movement was newly cleaned, the Vibrations were above $\frac{3}{10}$ of an Inch larger than in the free Air. But afterwards (I ſuppoſe from ſome of the fouled Oyl of the Pump ſpirtled on the Wheels, in letting in the Air, whereby the force of the Spring on the Pallets was blunted, from hence I ſay) as the Vibrations in the unexhauſted Receiver were a little contracted, ſo in the Receiver exhauſted they were more contracted, and only about 0, 25 of an inch larger than in the Free Air.

The *Alteration* in *Time*, which this difference of the Vibrations produced, was conſtantly only about 2 ſeconds in an Hour ſlower, in the Receiver exhauſted, than in it unexhauſted. For if in 4, 5 or more hours going, the two Pendulums did not vary a quarter of a ſecond in the open

Air, or when the Receiver was put over the little Movement, (but unexhauſted;) yet when the Receiver was exhauſted, the Half-ſeconds Movement would loſe, at the rate of two ſeconds in every hour, in every Experiment, in many hours going.

And because I was minded to ſee what alterations would ariſe from varying the Vibrations therefore by opening and ſhutting the Pallets, I cauſed the Vibrations in ſome Experiments to be as large as the Receiver would bear; in others, to be as ſhort as poſſible; always adjuſting the Pendulum to vibrate Half-ſeconds nicely in the Air. But ſtill the ſucceſs was much the ſame, or the difference ſcarce perceptible. But only I imagined when the Pendulum vibrated but a little way from the Perpendicular, that the Vibrations *in Vacuo* were not ſo much enlarged, as when it vibrated in a larger Arch.

In all theſe Experiments (which were repeated divers times with the ſame ſuccefs) I had no reaſon to move me to think, but that the Vibrations were enlarged *in Vacuo* by the vaſt Rarefaction of the *Medium*: I had I ſay no reaſon but this, That perhaps the different ſtate of the Air might alter the force of the Spring, which drove the Movement. For the tryal of this, I put a well adjuſted *Pocket-Watch* (with *Hook*'s Regulator, *i. e.* the common ſmall Spiral Spring to the Ballance) into the *Vacuum*. And after ſeveral tryals, at the ſame pitch of the Spring, I found not the leaſt alteration in the Watches going in many hours; neither the Springs, nor any other part of the Watch ſeeming to be in the leaſt affected by the *Vacuum*: but the Ballance circumvolving, or keeping the ſame Turns, as in the open Air.

But to be ſtill more ſure, if poſſible; it came after this into my thoughts, to try what the ſucceſs would be by putting the Half-ſeconds Pendulum again into the Receiver, and only pumping out a part of the Air. And accordingly I left no more Air in, than what kept the included Mercurial

Gauge at about 6 inches height. The event of which was, That the Vibrations were then not above $\frac{1}{10}$ inch larger on each ſide, than in the Receiver unexhauſted: and the Time loſt, but about half a ſecond in an hour, or $\frac{3}{4}$ at moſt. And ſo, according as the Mercurial Gauge was more or leſs high, I always found the Vibrations greater or leſſer; they gradually decreaſing, according to the quantity of Air re-admitted.

Having thus given an account of what I experimented, with all the Variety which I thought neceſſary, and with all the care I could, I ſhall for a Concluſion make ſome Remarks, and draw ſome Inferences from what hath been ſaid.

1. What *Mr Poyl* long ſince obſerved (from a Cock'd Piſtol going down as fiercely in his *Vacuum*, as in the Air) may be hereby farther confirmed, *viz.* That the Air is not the Cauſe of the Motion of Reſtitution in Solid Bodies, as Springs. For if it was, it would certainly have been diſcovered in ſo tender an Inſtrument as a well adjuſted Pocket-Watch, lying under the perpetual Influence of two Springs.

2. As *in Vacuo* (where the preſſure of the Atmoſphere is taken off) Heavy Bodies deſcend quicker than they do in the open Air: So it may be obſerved, That Pendulums move ſwifter in the Receiver exhauſted, than in it unexhauſted.

That Heavy Bodies deſcend quicker *in Vacuo*, is evident from the ſwift Deſcent of the leſs heavy Bodies, as *Cork*, the *Down of Sowthiſtles*, the *lightest Feather*, *&c.* which do all precipitantly deſcend, like a Stone, in a tall exhauſted Receiver.

And that the *Pendulum*, in our Experiment, moved faſter *in Vacuo*, is manifeſt from its vibrating but two ſeconds in an hour ſlower, when the Vibrations were $\frac{1}{5}$ of an inch on a ſide, enlarged by the higheſt Rarefaction of the Air. Whereas I find by experiment, that near the ſame encreaſe of the Vibrations, doth, in the open Air, make the Pendulum go 6 or more ſeconds ſlower in an hour. I ſay *near the ſame encreaſe*, becauſe it is ſcarce poſſible to manage the Pallets ſo, as nicely to make the ſame Vibrations as were *in Vacuo*.

3. The

8. The laſt thing I ſhall deduce ſhall be by way of Querey *viz.* Whether the Variations of Pendulums obſerved under the Equinoctial, and between the Tropicks, do not ariſe as much or more from the rarity of the *Medium*, and the encreaſe of the Vibrations conſequent thereupon? It is ſcarce I think to be doubted, but that the Air is much thinner, and finer near the Line, than it is without the Tropicks. And it is evident from the Barometer, that on the tops of high Mountains the Atmoſphere gravitateth leſs than nearer the Center. And therefore (although I like he Notion of the Decreaſe of Gravity from the Encreaſe of the diſtance from the Earth's Center; I ſay, although I like this too well to diſcard it, yet) I am apt to think that this is not the only reaſon of the *Phænomenon.*

I wiſh therefore that *Captain Halley*, when he obſerved at *St Helena* his Clocks to go ſlower than in *England*, had at the ſame obſerved whether the Vibrations were not enlarged. It might be therefore very well worth the while for ſuch as have opportunity, to take notice, Whether their Pendulums between the Tropicks do not make larger Arches than in higher Latitudes? Alſo in what Latitude they begin to alter? Whether the Vibration be greater near the Line, than in any other part between the Tropicks? Or whether the greateſt encreaſe be not always in thoſe places where the Sun paſſeth their *Zenith*? If the Vibrations be found larger under the Line, or in any other part of the Torrid Zone, then it may be obſerved, how much larger they are, and in what proportion they encreaſe, or decreaſe, by approaching nearer unto, or receding from the place of their greateſt Encreaſe?

Alſo it may be worth obſerving, Whether Pendulums do not vary on the tops of high places, or in different ſtates of the Atmoſphere, according as the *Mercury* is high or low in the Barometer? But then in this, and indeed in the former caſes, it is neceſſary, or at leaſt very expedient, that the Movement be ſo exactly well made, that the Power, whether Weight or Spring, do at all times exert the very ſame force upon the Pads or Pallets. Which is very rarely met with. For moſt Clocks are apt to vibrate ſometimes larger, ſometimes leſſer Arches in the 24 hours, according as the Weight or Spring doth more or leſs exert its *forces* on the work.

Thus having given the Society the account which they commanded me; if I have not anſwered their Expectation, yet I have however ſhewed my Obedience to their Commands; and given a Teſtimony of my great Veneration for that Ingenious and Learned Body.

V. *An Account of a Book.*

Apicij Cœlij de Opſonijs & Condimentis ſive Arte Coquinanariâ Libri Decem.
Cum Annotationibus Martini Liſter è Medicis Domeſticis Sereniſſimæ Majeſtatis Reginæ Annæ, & Varijs Lectionibus integris Humelbergij, Barthij, & Variorum.
Londini. 1705. 8vo.

THe Learned World hath been already oblig'd to the *Ingenious Editor* for his Notes upon *Sanctorius*, and *Hippocrate's Aphoriſms*; yet in this Edition of *Apicius* he is pleas'd to give further proofs of his generoſity in ſerving the Republick of Letters. His Preface may be juſtly call'd a Critical Introduction to the Hiſtory of *Apicius*, as to his Country, his Age, his Deſign, and the Various Editions of him, at *Venice*, *Baſil*, *Lyons*, and *Zuric*; amongſt which many doubts are clear'd up, and the Annotations themſelves of *Dr Liſter* will appear as Valuable as thoſe of the moſt profeſs'd *Criticks*, He being intent upon Things, and They too frequently upon Words.

After the *Prolegomena* come the X Books of *Apicius* under their diſtinct Titles, with the *Scholia* and Notes of *G. Humelbergius*, *C. Barthius*, *Dr Liſter*, and others; amongſt which are interſpers'd ſeveral Remarks of *J. Caſaubon*, *Salmaſius*, *Nonnius*, *&c.* all diſtinguiſh'd in the ſeveral Columns of this beautiful Edition.

Amongſt theſe, the Reader will meet with many paſſages of the Ancients illuſtrated, and ſet in a true light; eſpecially *Horace*, *Celſus*, *Scribonius Largus*, *Dioſcorides*, *Pliny*, *Athenæus*, *Celius Aurelianus*, *Martial*, *Petronius*, The *Rei Ruſticæ Scriptores* the *Geoponici*, and many others. At the End there is a very particular and compleat *Index*, of great Uſe in a Work of ſuch Variety of Words and Matter, as muſt needs occur in the *Diætetic Medicine*.

'Twas thought proper to Print only 120 Copies of this Piece, to ſatisfie the Curious, (who may be very few) at the expence of ſome Noble and Liberal Subſcribers, whoſe Names are affixt on the back of the Title Page; after the manner of publiſhing *Mr Lhwyd's Lithologia Britannica*, in the year 1699. *London.* 8vo.

Printed for *Sam. Smith* and *Benj. Walford*, Printers to the Royal Society,
at the *Princes Arms* in *St Paul's* Church-yard, 1705.

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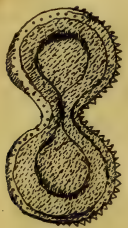

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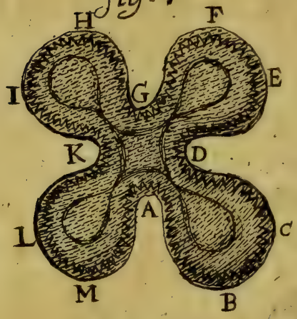

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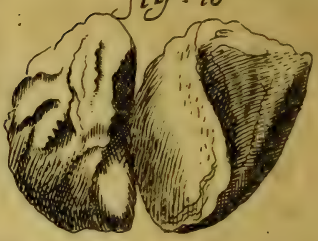

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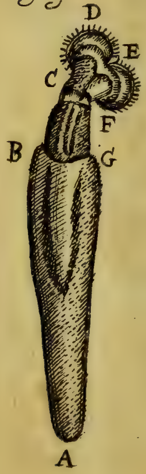

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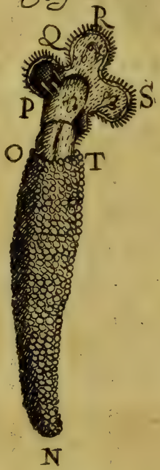

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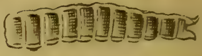

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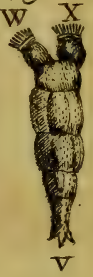

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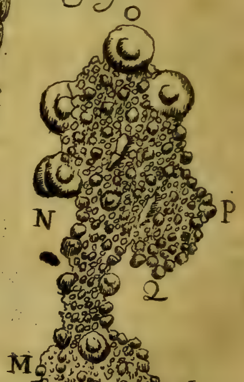

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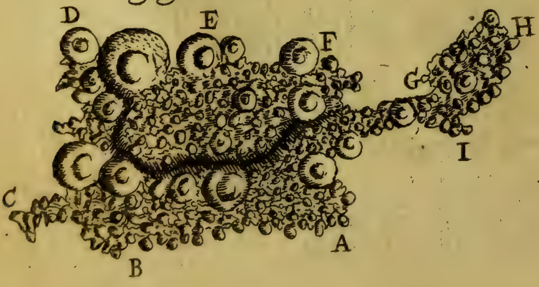

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PHILOSOPHICAL TRANSACTIONS.

For the Month of January, 1705.

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I. *A Letter to the Royal Society, from Mr* Anthony Van Leeuwenhoek, *F. R. S. concerning* Animalcula *on the Roots of Duck-weed,* &c.

YOu may remember, that in my Letter of the 25th of *Decemb.* 1702. I affirm'd that the Animalcula, repreſented by Fig. 8. a. b. c. that were faſtned to the ſmall Roots of that Green ſtuff found on the top of the Water in our Ditches and little Canals, which we call Duck-weeds, had two ſmall Wheels iſſuing out of their Bodies.

A certain Curious Gentleman, that ſaw the Motion of theſe Wheels with great ſatisfaction, entreated me, that when I had an opportunity, I would once again ſhow him this Wonderful Rotation.

In the Month of *July* laſt, I cauſed ſeveral of theſe Weeds, as they were carried by the Stream thro our Town, be taken out of the Water in an Earthen Pot, and took my full view of the foremention'd Animalcula at ſeveral times, which appear'd as here in Fig. 1. A B C D E F G. The Caſe or Sheath of which is repreſented by A B G, into which the Animalculum betakes itſelf, upon the leaſt ſhaking or ſtirring of the Duck-weed, and then thruſts itſelf out again as far as B C F G, and at the ſame time appear the two little Wheels deſcribed by C D E F, in obſerving the Motion of which one would be apt to think they were two real Revolving Wheels.

But ſo ſoon as we were able to place the Animalculum before our Eyes, in ſuch a poſition that we could view the little Wheels, not partially, as is here repreſented, but compleatly, and all at once, we were convinced of our Miſtake in our former Aſſertions; for now we ſaw clearly that what appear'd before to be two diſtinct little Wheels, was really one and the ſame Circumvolution.

Now, in order to give you a clearer Notion of the two deſcribed Wheels, I order'd the Painter to draw 'em larger than they appear'd to his ſight.

Fig. 2. H I K L M repreſents the ſaid Wheels, in which the Rotation proceeds from H to I, and ſo on from I to K, and from K to L M.

I have often ſtood in ſuſpence whether this Regular and Wonderful Rotation did really happen as it appeared to me, and ſeveral other Gentlemen that ſaw it; yet I could not chuſe but be ſatisfy'd at laſt of the *Phænomenon*, foraſmuch as having, in order to my entire ſatisfaction, thrown away thoſe Wheels (to the Roots of which the ſaid Animalcula cleaved) and made my Obſervations on ſeveral others, I found the ſame event every time, only with this difference, that the internal Arches in Fig. 2. deſcribed by K and M, were not near ſo much Indented.

During thoſe Obſervations, one Animalculum appear'd to me, as in Fig. 3. N O P Q R S T, and N, that part of it by which it was faſtned to the Weed.

This Animalculum had his Receptacle or little Houſe (repreſented by N O T) compoſed of Round Bubbles, which Figure had not occurr'd to me before.

When this Animalculum had thruſt that part of its Body, from O to P, out of its Caſe or Shell, it produced out of its own Body at the ſame time that Wonderful Wheel-work that conſiſted of four round parts, repreſented in Fig. 3. by P Q R S, three of which were to be ſeen very plain, but the fourth at T was almoſt hid from the ſight.

All this Wheel-work moved from P to Q, and from R to S.

After I had nicely obſerved the ſaid Animalculum, I [illegible]cted the Painter to draw the ſame as well as he could, according to its appearance in Fig. 3.

After ſome little time this Animalculum appear'd in ſuch a poſition that we could compleatly ſee all the four parts, whereupon I order'd my Painter to deſcribe the Rotation with a larger Circumference than it really appear'd, to the end that you may the better underſtand this wonderful and unconceiveable Wheel-work with all its Teeth.

Fig. 4. A B C D E F G H I K L M repreſents that Inſtrument that in Fig. 3. is for the moſt part of it deſcrib'd by P Q R S, in which we ſaw the ſaid Teeth and Wheel-work move from A B C to D, and from D to E F G, and after that manner perform the whole Revolution; and foraſmuch as I had placed the ſaid Delightful Animalculum juſt as it was faſtned to the Root of the Weed in the Water, before my Microſcope, I took that opportunity to communicate a view of it to two ſeveral Gentlemen, who were ſtruck with the greateſt Amazement at the ſight of ſuch an inconceivable Rotation; and at the leaſt ſudden touch of the Animalculum, it preſently drew the Wheel-work into its Body, and then its whole Body into its Caſe or Shell, ſo that we could ſee nothing but a kind of Horn, Fig. 3. N O T, in which it hid itſelf; but it quickly put forth that part of its Body deſcrib'd by O P Q R S T, and then the Rotation or Wheel-work proceeded as before.

Now if any body ſhould be inclin'd to make this Experiment after me, he muſt take care to chooſe out Duck-weeds that have long Roots, for I never obſerv'd any of theſe Animalcula in the ſhort Roots of young Weeds, nor indeed in the great Roots, when once they are covered with a rough Matter, and tending to a Decay, as I have ſeen a great many in the beginning of *Auguſt*; neither ought he to leave off his Enquiry, tho he ſhould meet with ten or twenty Roots that have none of the abovementioned Animalcula in them; for it has happen'd to me that I have examin'd more than five and twenty Roots, without meeting with any of theſe Animalcula on them; as alſo, on the contrary, I have ſometimes found three of 'em upon one Weed.

Moreover, in one of my Glaſſes, in which I had ſhut up a Weed with its Root, there was an Animalculum of the length of the third part of an Inch, and ſomething thicker than the ſmall Root of the Duck-weed, the Body of which was for the moſt part Tranſparent, only there was a Gut or Inteſtin that ran thro' the whole length of the Body, and was wrinkled or ſhrivel'd in ſeveral places; and as it came towards the Head it grew rounder and thicker, which I imagin'd to be the Maw or Stomach. This Gut was full of Meat throughout, which the Animalculum had gather'd either from the Roots, or the excreſcent Particles round about it; and foraſmuch as the upper part of the Head was provided with a long and pointed Horny ſubſtance like a Sturgeon, ſo alſo was the Mouth inwards, and joyn'd to the end of the Belly.

The ſaid Gut being fill'd with Meat was in a continual Motion, which I call a pinching or twitching, in order to the attenuation or protruſion of the Chyle; and if the Guts had not been full of Meat, which hinder'd the Tranſparency thereof, I ſhould have ſeen all the Joynts of the Back bone.

The third day, after I had ſhut up the Animalculum in my Glaſs, I ſaw a long and ſlender little Worm, that I judged to be a Thouſand times ſmaller than the aforeſaid Animalculum, which had inſinuated, or bor'd Part of it ſelf into the Body of the Animalculum, and, as far as it appear'd to me, the Worm labour'd to get in his whole Body; and the next day in the morning I diſcover'd that it was in a manner quite got in, and at night I could ſee nothing of it but a little bit ſticking out; and then I could ſee, that in the place where the Worm had inſinuated itſelf, the Animalculum was partly without any Meat, or Motion, whereas there ſtill remain'd ſome Motion above and below that place: Upon the fifth day after, I ſaw another Worm trying to get into the Body of the Animalculum, upon which it made a great ſtir with its Body, and ſo ſhook off its Enemy; and preſently after I ſaw no Motion in the Guts, ſo that I concluded that the Death of the Animalculum was approaching; after which it did abandon the Root of the Duck-weed, and placed itſelf on the ſide of the Glaſs, and a little while after I ſaw it lye dead at the bottom; from whence I firmly concluded, that the Death of the Animalculum was occaſion'd by the Worm's piercing into its Body, whereupon the Guts were ſo wounded that they were depriv'd off all Motion.

Among ſeveral ſorts of ſmall Animalcula, I obſerv'd Three whoſe Bodies were about as thick as the Hair of ones Head, and Ten times as long.

Theſe Animalcula were ſo Tranſparent, that at firſt I took 'em for nothing but empty Skins; for one could ſee nothing but an exceeding ſmall part of it about the Head, and the hinder part of the Body that was not Tranſparent; and that part which I judged to be the Bowels, was a ſmall part of it inclining to a yellowiſh colour; and they had on the fore part of the Head two (as it were) very crooked Claws, and on the hinder part of the Body ſeveral Tranſparent Hairs.

I obſerv'd theſe Animalcula ſeveral days together, and always ſaw that they moved their Bodies very nimbly in a Serpentine motion; and as it were in an inſtant of time, and ſo removed about from place to place; and as often as I view'd them, I could never find that they ſat ſtill on the Roots of the Duck-weed, or on the ſides of the Glaſs, but were continually roving about in the Water.

Afterwards, when I lookt upon 'em again, I could not perceive the leaſt Motion in their Bodies, either inward or outward, but obſerved that ſometimes they ſubſided in the Water, and then emerged again, but very leiſurely; which appeared very ſtrange to me, becauſe, as I ſaid juſt now, I could not diſcover the leaſt motion in their Bodies; tho I don't doubt to Aſſert, that there is ſome Motion, be it never ſo ſmall, in a Body, which in the ſpace of 2 or 3 Pulſes ſhall one while ſink to the bottom, and then riſe to the top; for it is impoſſible for us, to ſet an inanimate Body in the Water in ſuch a poſition, that it ſhall neither ſink quite down, nor emerge quite up to the ſuperficies; and tho we could find a Body (which yet I think is not to be done) that ſhould be juſt of the ſame weight with Water, it could not keep the place in the Water to which it was firſt aſſign'd; for, according as the Water, into which you put that Body, ſhould encreaſe or diminiſh in Heat, that ſame Water would proportionably take up more or leſs Space; and conſequently the Body, that was ſo placed that it could neither entirely emerge nor ſubſide, if the Water, for example, ſhould become warmer, and ſo take up more room, would immediately ſink to the bottom. In ſhort, we have reaſon to be confounded in our imaginations, when we meet with ſuch Animalcula as I before deſcrib'd.

The only Solution therefore that I can give in this caſe, is, That ſuch an Animalculum has ſome Air in its Body; and that by ſqueezing and contracting of its Body it can emit ſome of the *Materia Subtilis* that is mixt with it, by which it naturally ſubſides; and on the contrary, by dilating its Body again, an equal quantity of the ſame *Materia Subtilis* is let in, and ſo the Animalculum, without ſtirring itſelf, ſhall riſe or ſink.

Now I was the more eaſily induced to ſay what I formerly did about the Animalcula that are faſtned to the Roots of Duck-weed; to wit, that they had two diſtinct revolving Wheels, as they appear'd to others as well as my ſelf; becauſe I have diſcover'd ſeveral Animalcula that thruſt out two Wheels out of the fore part of the Body as they ſwim, or march on the ſides of the Glaſs; one of which I caus'd to be deſcrib'd by Fig. 5. V W X.

This ſort of Animalcula I found in great numbers in the Gutter-water in Summer, which had ſtagnated ſome days in the ſmall Pits or Cavities of the Lead. Theſe Animalcula are gradually leſs and leſs, ſo far that 50 ſmall ones are not ſo large as one great one, or full grown Animalculum, that was big with young.

In *Octob.* 1702. I cauſed the Filth or Dirt of the Gutters (when there was no Water there, and the Dirt was quite dry) to be gathered together, and took about a Tea-cupful of the ſame, and put it into a Paper upon my Desk; ſince which time I have often taken a little thereof and pour'd upon it boyl'd Water after it had ſtood till it was cold, to the end that I might obviate any objection that ſhould be made, as if there were living Creatures in that Water.

Theſe Animalcula when the Water runs off them, or dries away, contract their Bodies into a Globular or Oval Figure.

After that the abovemention'd Dry ſubſtance had lain near 21 months in the Paper, I put into a Glaſs Tube of an inch Diameter the remainder of what I had by me, and pour'd upon it boyl'd Rain Water, after it was almoſt cold, and then immediately view'd the ſmalleſt parts of it, particularly that which ſubſided leiſurely to the bottom, and obſerv'd a great many round Particles, moſt of which were reddiſh, and they were certainly Animalcula; and ſome hours after I diſcover'd a few that had open'd or unfolded their Bodies, ſwimming thro' the Water, and a great many others that had not unfolded themſelves were ſunk to the bottom, ſome of which had little holes in their Bodies; from whence I concluded that the little

Creature call'd the Mite had been in the Paper, and prey'd upon the aforeſaid Animalcula.

The next day I ſaw three particular Animalcula ſwimming through the Water, the ſmalleſt of which was 100 times ſmaller than the aboveſaid Animalcula.

Now ought we not to be aſtoniſh'd to find that theſe ſmall Inſects can lye 21 Months dry, and yet live, and as ſoon as ever they are put into Water fall a ſwimming, or faſtning the hinder parts of their Bodies to the Glaſs, and then produce their Wheels, as in Fig. 5. W X, juſt as if they had never wanted Water.

In the month of *Septemb.* I put a great many of the laſt mention'd Animalcula into a wide Glaſs Tube, which placed themſelves on the ſides of the Glaſs preſently, whereupon I pour'd the Water out, and then obſerv'd that ſeveral Animalcula, to the number of 18 or 19, lay by one another in the ſpace of a Courſe Sand ; all which, when there remain'd no more Water, cloſ'd up themſelves in a globular figure.

Some of the Bodies of theſe Animalcula were ſo ſtrongly dry'd up, that one could ſee the wrinkles in them, and they were of a Reddiſh Colour ; a few others were ſo Tranſparent, that if you held them up between your Eye and the Light, you might move your Fingers behind 'em, and ſee the Motion thro their Bodies.

After that theſe Animalcula had lain thus dry'd up a day or two, I invited ſome Gentlemen to come and partake of the agreeable Spectacle with me ; that is, to ſee how the ſaid Animalcula would diveſt themſelves of their Globular figure, and ſwim about in the Water.

According to which, after my Friends had ſatisfy'd their Curioſity, in viewing the Animalcula in their oval or globular form, ſome of which were ſo Pellucid as if they had been little Glaſs Balls, I pour'd ſome Water into the Glaſs Tube, whereupon they preſently ſunk to the bottom ; and then the Gentlemen took the ſaid Tube into their Hands, and viewing it one after the other thro a Microſcope, they ſaw the Animalcula after the ſpace of about half an hour beginning to open and extend their Bodies, and getting clear of the Glaſs, to ſwim about the Water, excepting only two of the largeſt of them, that ſtay'd longer on the ſides of the Glaſs, before they ſtretcht out their Bodies, and ſwam away.

When I was by my ſelf, I view'd theſe Animalcula with a Microſcope, after I had pour'd the Water from 'em, in order to ſee how they brought their Bodies into that Orbicular form as is mention'd above; and having fixt my Eye upon two of the biggeſt of them, I obſerved that they did ſtretch out their Bodies in the ſpace of a minute ſeveral times to an extraordinary length, and thrice open'd the hinder part of their Bodies, and diſcharg'd ſome Excrements, which, in the little Water that remain'd about them, were diſſolv'd into ſmall Pellets, before they aſſum'd their round figure; and foraſmuch as I imagin'd that the Female Animalcula endeavour'd to diſcharge themſelves alſo of the Burden of their Young, my Obſervations had laſted longer, but my Eyes being tir'd, I adjourn'd 'em to another time.

In the month of *Octob.* of the laſt year, before the Dirt and Filth of my Leaden Gutter was quite dry'd up, I took a handful of it, and laid it on a glaſed Earthen Diſh, in order to preſerve it; for I don't ſuffer ſuch foul ſtuff to lye long in my Gutter, but twice a year cauſe the Lead to be ſcower'd ſo clean that it looks juſt like New.

This foul ſtuff being dry is as hard as Clay; ſo that the Mites can't come at the Animalcula, that are thus doubly ſhut up; and now we ſhall ſee whether they will live longer than 21 months.

A few days ago I took ſome of this ſame dry ſtuff, and infus'd it both in cold Water that had been boyl'd, and in Rain Water newly fallen; whereupon the Animalcula began to ſhow themſelves, and that in great numbers; and ſoon after two ſorts of much ſmaller Animalcula.

In my Letter of the 8th of *Jan.* laſt, I writ to you about the dreadful Storm that had happen'd the 8th of *Decemb.* before; and I told you then that the ſtrong Winds had carried the Waves of the Sea over our Meadows and Orchards, from whence I preſaged a fruitful year, but few people took notice of my predictions; however, having diſcours'd ſeveral perſons, that concern'd themſelves in Tillage or Grazing, upon that ſubject, they all aſſur'd me, that they had never known ſuch a plentiful year for Graſs, as alſo for Peas and Beans, as was the laſt Summer; and among others, I enquir'd of a Gentleman, that does Fatten *Daniſh* Oxen every year, about the ſame: Whoſe anſwer was, That he had a piece of Ground on which he fed 26 Oxen, and that if he had turn'd 26 more into the ſame Paſture, there would have been Graſs enough for them; and that he had never ſeen ſo much Graſs before; and that the Oxen were exceeding fat.

II. *Ob-*

II. *Obſervations on ſtaining the Fingers with a Solution of Silver in* Aqua Fortis, &c. *In a Letter from Mr* Anthony Van Leuwenhoek, *F. R. S.*

Delft in *Holland*, *March* 3. 1705.

SEveral Months ago, I took 24 Ounces of mixt Metal, and put the ſame into *Aqua Fortis*, and ſet it on Warm Sand, and there being a fault in the Glaſs, it crackt ; by which ſome of the *Aqua Fortis*, which was impregnated with Silver, run into the Sand, and I don't know but I might have loſt Gold alſo in the ſame. This Sand, as much of it as was wet, I got together, and tho' I took all the care imaginable, that the wet Sand ſhould not ſtick to my Fingers, yet I ſaw the tips of them were ſtain'd, that I could ſee a diſcolouring of the Skin with my naked Eye ; and as this happen'd in the Evening I waſht my Hands in common Water, and I ſaw the next day, that the tips of moſt of my Fingers were black.

I then took, according to the Surgeon's Inſtructions, ſome freſh Butter to get the blackneſs off of my Hands and Fingers, but how hard ſoever I rubb'd them with the ſaid Butter, yet I could not ſo much as ſtir the blackneſs ; ſo then I took ſome Soap, but all in vain. I rubb'd my Thumb on a Grindſtone with Water and Sand, which leſſen'd the blackneſs a little, but did not take it quite off. The third day, looking very attentively upon my black Fingers, I reſolv'd to cut off ſome thin Scales of the Skin, aud to ſee if I could get any Silver out of it, ſo as to be able to perceive that it was Silver. I cut off ſome ſmall pieces of Skin with a ſharp Knife, without fetching the leaſt drop of Blood after it, which pieces of Skin being no bigger than the 4th part of my Nail, I laid on Charcoal, ſuch as is uſed by the Gold and Silver Smiths, and with the help of a Pipe, I blew the flame of a Candle very gently upon the ſmall Particles of Skin that were cut off, which frying in the flame, a great many Bubbles of Air roſe in them; and at laſt, driving more Fire upon them, the Skins were burnt, and the Particles of Silver with which they were laden remain'd, being melted into round Globules, inſomuch that I judged that a thouſand of the ſmalleſt could not make one great one; and narrowly viewing ſome of the largeſt, I could ſee that they were compoſed of abundance of ſmall Globules, which the Fire was not ſtrong enough to diſſolve into a perfect Roundneſs; theſe aforemention'd Silver Globules were not ſo big as to be ſeen with the naked Eye. I repeated this Operation the fourth day, after my Hands had been ſo ſtain'd, and that with the ſame ſucceſs.

I brought theſe Silver Globules before two Microſcopes, that ſome others who delighted therein might ſee them, and ſay in jeſt concerning the ſame, that I could bring Silver out of my Skin; but 'tis in this matter as by the Chymiſts, who bring Gold and Silver out of that in which it was before; but to make Gold or Silver, or to encreaſe it, finds no Credit with me. When I had placed the ſaid Particles of Silver before a Glaſs, and had ſhew'd it to a Gold and Silver Smith, I took ſo much delight in it, that I cauſed a Draught of it to be taken.

Fig. 6. A B C D E F G H I ſhews the abovementioned Silver Globules as they appeared thro the Microſcope, and as they were joined to one another in Melting; from whence appears that the Fire was not hot enough to form 'em all in one Globule, and in my opinion they were no bigger than one courſe Grain of Sand.

Fig. 7. K. L. M. N. O. P. Q. ſhews alſo ſome Silver Globules, which were melted in the Fire, after the ſame form, and which came alſo out of a ſmall piece of Skin of my Fore-finger, that was not bigger than the 4th part of my Nail. That round part markt K, L, M, was alſo ſurrounded with a great many ſmall Bubbles, that were all of them Melted, but not ſo compleatly as to be join'd in one.

Now that I am ſpeaking of *Aqua fortis* that was impregnated with Silver, I can't let ſlip the opportunity of telling you, that ſome time ago, my Middle Finger, againſt which the Pen leans when I write, had a ſort of a Swelling, which often pain'd me when I ſqueez'd it, ſo that I was reſolved for 6 or 8 days to cut off that ſwelling with a little Knife; and I fancied that there might be in that place a bit of Glaſs under the Skin, as happen'd to me formerly in another place; wherefore I open'd the Skin with a Needle in that place ſeveral times, and rak'd in it, until the Blood came, but I could not diſcover any Glaſs; at laſt, after I had cut off the Swelling, I lookt on the place with a Microſcope, and found that there was a ſmall roundneſs in the Skin that was cut off, which I looſen'd as much as I could with a ſharp Needle round about; and taking hold of it with a Pair of Tweezers, I pull'd a long Particle out of the Skin, which was about the thickneſs of a ſlender Pin, and about ten times as long as its Diameter, ending in a point, having at the Root of it ſome ſmall Veſſels or Veins, out of which I could perceive it receiv'd its Nouriſhment. In the Concavity of the Skin, out of which the ſaid Thorn-like Particle proceeded, I thruſt a little bit of *Roman* Vitriol, and then I dropt a little Water on the Vitriol, that it might diſſolve, and that it might kill the Roots from whence this Thorn-like Particle ſprung; and tho I repeated this ſeveral times, yet it grew in a few days again.

Hereupon I took ſome *Aqua fortis*, and dropt a ſmall drop of it into the Concavity of the Skin, and aſſoon as t was there, it ſeem'd as if it boil'd; which was occaſion'd by the Air Bubbles that endeavour'd to force their way out; aſſoon as the *Aqua fortis* had penetrated it to the ſenſible part of the Skin, it cauſed a Pain, which I endured a little while, and then I poured ſome common Water on my Finger to weaken the *Aqua fortis*; but quickly after the Thorn-like Particle was encreas'd, as before. I took the ſecond time *Aqua fortis*, and let it lye ſo long on the Skin, that it ſmarted more than it did before; and ſince that time I have not perceived that Particle to grow any more.

I have lying on my Desk a Linnen Handkerchief, which was ſtain'd with *Aqua fortis* impregnated with Silver, with a black ſpot about as large as a ſhilling; after that this Handkerchief had been waſht 6 times, and laid to bleach, I cut out the black ſpot, and burnt it upon a bit of Charcoal, and viewed what remain'd thro a Microſcope, which I found to conſiſt of ſeveral Thouſand Globules of Silver, of an exceeding ſmallneſs.

III. *A Letter from Dr* W. Muſgrave, *F. R. S. to Dr* Hans Sloane, *S. R. S. concerning* Hydatides *voided by Stool.*

THo the Particulars, diſcharg'd preternaturally by Stool, have been of very different ſorts; and tho *Hydatides* have been found in ſeveral parts of the Body, and (as appears from a late Tranſaction) in the Urine; I do not find they are, from any good Authority, affirm'd, to come off *per anum*, or to be found in the *Ductus alimentaris:* An Inſtance whereof, falling of late in my way, is here preſented to you.

In *April* laſt, I was deſired, together with my Friend, Dr *C.* of *Tiverton*, to ſee a Woman of that Town, named Mrs *Pear.* She is about 30, of a tender Conſtitution; had an ill habit of Body, and about *Candlemas* laſt a Fever; which continuing near three weeks, was at length overcome by Teſtaceous Powders, *Alexipharmacs*, but chiefly by the *Cortex.*

In this Fever ſhe had ſowr Vomitings, and a pain in her Stomach; which remain'd a long time, and, after the Fever, was accompanyed with a copious Salivation; with Wind, and pains in her ſide, to a degree extraordinary; under all which ſhe labour'd to the time of my ſeeing her.

About three weeks before my Viſit, ſhe was ſeiz'd with a Jaundice, and while taking Medicines (*Pilulas & Decoctum Ictericum Fulleri*) for that Illneſs, ſhe brought off ſeveral *Bladders, by Stool*; and continued ſo to do, ſometimes every day, at other times once in two or three days, ever ſince the firſt diſcharge of this kind, to the time of my Viſit.

Theſe *Bladders* were of various ſizes; the leaſt that came off, was of the bigneſs of a great Pins head; the largeſt, equal to a Pullets Egg: They were alſo of differing Colours; ſome white, others more yellow, from the Liquor contain'd in them, which was a ſort of Gelly, like that of Harts horn, ting'd more or leſs with Saffron.

Before the Diſcharge of theſe *Bladders*, there was (beſides the Symptoms already mention'd) a Coldneſs, and Sickneſs at Stomach, almoſt perpetual; with frequent Inclinations to Vomit, and Hyſteric Suffocations: Since that Diſcharge theſe Symptoms are vaniſht, and ſucceeded by a Soreneſs of the ſame part, as if ſomething had been torn there.

The *Bladders* came off without pain; many of them whole and entire; one of which I ſaw about the bigneſs of a large Gall, or Marble Stone: Others were broken, and appear'd not unlike the empty Skins of Corrants, Gooſeberries and Plums.

Only one *Bladder* came away by Vomiting, and that broken ; but, to all appearance, had been large almoſt as a Gooſe Egg. The Gelly thrown up with this *Bladder*, and which in all likelyhood had been contain'd in it, (before it broke in coming up) was thicker, and more fœtid, than was found in any of the other *Bladders*.

The number of thoſe which came off by Stool, made ſeveral ſcores.

During the whole courſe of this Illneſs, the Patient was rather looſe than Coſtive ; had no manner of Appetite, and ſeldom ſlept without an Opiat.

I found her much waſted in Fleſh, with a dead pale Look ; ſuch as argued her to be very low. She had Stools of an unuſual Smell, no way natural, and had vomited a great deal of cold Phlegm.

She was very willing to think theſe *Bladders* came from her Stomach, and urg'd the following Reaſons for her opinion ; Firſt, for that, had they been originally in the Bowels, in all likelyhood the Purges (of which ſhe took many in the *Jaundice*) would, as ſhe ſaid, have carried them off much ſooner. Secondly, From the (almoſt) conſtant pain of her Stomach, and frequent inclination to Vomit, ever ſince her Fever, to the time of the *Bladders* being Diſcharged. Thirdly, From the Rawneſs and Soreneſs of her Stomach, after the *Bladders* came off.

This was her opinion, and theſe her Reaſons for it ; and indeed, I think, they may be eſteem'd ſo far of force, as to prove, That ſome, and perhaps a great number of theſe *Bladders* came from her Stomach.

There was no appearance,in any one one of theſe *Bladders*, of ſuch an Order of Parts, or Organs, as ſhew'd them to be Inſects ; nor upon Examination was there any Animal diſcern'd in the Liquor contain'd in them. Indeed, theſe Obſervations were made only by the naked Eye, (for we had not the opportunity of a Microſcope;)What Diſcoveries might have been made by a more ſtrict Enquiry, I cannot ſay.

The Medicines given, after I was call'd in, were chiefly of the *Vulnerary* and *Digeſtive* kinds: That which did her moſt ſervice, (but it was after the *Bladders* were come off) was a *Tincture of Myrrh and Gentian*, in large and frequent Doſes; and with a proper Vehicle: Under the uſe of this ſlight, but advantageous Medicine, from a very weak condition, ſhe recover'd an Appetite, *&c.* and is now perfectly well.

Exeter, Sept. 26. 1704

IV. *A Letter from Mr* John Thorpe, *M. A. of* Univerſity *College in* Oxford, *to Dr* Hans Sloane, *S. R. S. concerning Worms in the Heads of Sheep,* &c.

With this you receive the delineation of a Worm, found in diſſecting the Head of a Sheep, in the Cells form'd between the *Laminæ* of the *Os frontis*: It is an *Apode*, and ſeems to be a ſpecies of the *Eulæ*; tho much different from the common ſort breeding in putrid Fleſh. It is every where of a fair pale colour, excepting its Tail, which ends a little obliquely in a Plane; on which are impreſs'd two remarkable black ſpots, (as in Fig. 8.) Beſides two ſmall white *corniculæ*, its Head is arm'd with a pair of black, ſharp, and crooked *forcipes*, which, in contracting, and extending its Body, it draws in, and puts out at pleaſure: With theſe it is, that in creeping it takes hold of the ſurface of the Body, on which it moves; and draws it ſelf forward on pretty large, protuberant, and ſomewhat flattiſh *toruli*, fewer in number than thoſe on its Back, (*vide Fig.* 9.) which alternately ſwell'd and relax'd, ſeem inſtrumental to its motion, and ſupply the place of Feet. It looks of a clear, Cryſtalline ſubſtance, and almoſt tranſparent.

The Membrane, that inveſted the cavity of the Cells containing it, was very fat, and in moſt places ſeparated from the Bone ; the Blood-Veſſels appear'd turgid, and inflam'd : Whereas the Membrane of the oppoſite Cells, which have no Communication with theſe, was thin, pellucid, adherent, and no ways preternaturally affected.

I have given the more particular deſcription of this Worm, and the Cells, it was found in, it not being deſcrib'd by any Author, I have yet conſulted. Mr *Bobart* informs me, “ That ſome curious Gentlemen of the Uni- “ verſity, lately obſerv'd three Worms lodg'd in the ſame “ parts of the Head of a Sheep, but in two diſtinct Cells: “ The largeſt apart by its ſelf, the other two in the Cell “ adjoyning ; one of which was conſiderably leſs than “ the other, agreeing in form with the forementioned, of “ a whitiſh colour in general, with the two notable ſpots “ on the flat of the poſterior part, but a ſhadow of “ brownneſs from the back down the ſides, (eſpecially of “ the riper one ;) roundly turgid on the back, and flat “ underneath ; divided with ſeveral *annuli* , as theſe “ Creatures generally are ; at the extremity of which Pro- “ tuberances, ſerving inſtead of Feet, there appears a little “ darkiſh brown ſpot on each ſide or edge : as they faded “ and wither'd, they chang'd to a light red or phœnicious “ colour, and afterwards brown.

(a) *Mouſet* mentions Worms yearly breeding in the Brain of Stags, Goats and Sheep, (eſpecially when fat) but ſuppoſing them generally known, gives no deſcription of them ; unleſs from (b) *Benedictus* and (c) *Mathiolus*, that they are *Eulis maximis æquales, & ejuſdem cum illis formæ:* Tho the Worms meant by thoſe two Authors are not found in the Brain, but (as they both agree) *ſub lingua in concavo circiter vertebram, qua cervici innectitur caput.* (d) *Avicenna* aſſerting the poſſibility of Worms breeding in the Head, ſays expreſsly *multoties naſcuntur in anteriore*

parte

(a) *Theatr. Inſect. lib.* 2 *cap.* 10.

(b) *Lib.* 21. *in proœm.*

(c) *Comment. in Dioſcor. lib.* 2. *cap.* 52.

(d) *Lib.* 3. *fen.* 1. *can.* 3. *tract.* 2. *cap.* 3.

parte capitis ſuper locum qui eſt in ſtrictura narium: To which (e) *Joubertus* adds, *ubi oves, & capræ dicuntur perpetuò vermes habere, ut cervi in gutture.* This plainly ſhews the diſtinct places of their generating in the Heads of Stags and Sheep, as well as deſcribes the particular Cells, in which they are found in the *Os Frontis* of the latter.

(e) *Cap. 9. de Cephalalgiâ.*

(f) *Trallian* relates a memorable Story from *Moſchion*: *Demopcrates* the *Athenian* applying himſelf to the Oracle at *Delphos* for the Epilepſy, receiv'd the following anſwer;

Μεῖζον' ἀειράμενος κεφαλῆς ποιμνήιον εὐλὴν
Μηκάδος ἀγρονόμοιο, δέρας περικάμβαλε μήλου
Ἕρπηλα πολύπλεκτον ἐϋρῖνε ἀπὸ κόρσης.

[illegible]) *De Arte Med. lib. 1. cap. 15.*

Which *Guinterius Andernacus* renders thus;

De grege ſume capræ majores ruris alumnæ
Ex cerebro vermes, & ovis dato tergora circum
Multiplici vermi pecoris de fronte revulſo.

Democrates not comprehending the hidden meaning of the Oracle, referr'd it to *Theognoſtes Democratius*; who recollecting that the Head of a Goat near the *Baſis* of the Brain is naturally impregnated with Worms, right ſagely unfolded the Myſtery; adviſing him in purſuance to *Apollo*'s directions to procure one or three of them (for, it ſeems, it muſt be an odd number) by provoking the animal to ſneeze; and wear them about his Neck, in the Skin of a black Sheep, as an Amulet.

'Tis not to be imagined, how Worms ſeated at the *Baſis* of the Brain, where *Trallian* places them, ſhould be expelled by ſternutories. The words of the Oracle [Ευεῖνε ἀπὸ κόρσης] admit of a more favourable conſtruction, and diſtinctly expreſs the cavity over the Noſe: from whence by a paſſage, that opens into the Palate and Noſtrils, they may eaſily be diſcharged by ſneezing. By the ſame paſſage they may as eaſily inſinuate themſelves, when ſmall; or rather be drawn up with the breath in the ſtate of Eggs, and depoſited in thoſe Cells: Where animated by the Vital Heat, and nouriſht by preying on the Membrane, in which they are included, they may more probably occaſion the Epilepſy in Sheep and Goats, (a Diſtemper (g) *Hippocrates* obſerves to be frequently incident to them, tho he aſcribes it to a different cauſe) than cure it in Men.

From hence perhaps we may be allow'd to account for thoſe various Inſtances given by Medicinal Authors, of Worms ejected at the Noſe by Men and Women. (h) *Beniverius*, (i) *Fernelius*, (k) *Zacutus Luſitanus*, (l) *Ronſſeus*, (m) *Trincavellius*, (n) *Hildanus*, (o) *Baptiſta Codronchus*, (p) *Tulpius*, (q) *Verzaſcha*, and (r) others, relate ſeveral caſes of this kind; all agreeing that they were attended with extream Pains in the Head, *Mania's*, *Lypothymies*, *&c.* which immediately ceas'd at their ejection.

It muſt be granted, (s) *Ægineta*, (t) *Gabucinus*, (u) *Foreſtus*, (w) *Barellus*, and particularly (x) *Fulvius Angelinus*, who wrote an entire Diſcourſe *De Verme admirando per Nares egreſſo*, very rationally conclude, the Worms they treated of came from the Stomach, or Lungs, they not being attended with thoſe Symptoms, nor affecting the Head; as in the caſes related by the Authors we have mention'd; particularly in that remarkable Inſtance of (y) *Hollerius* of a Worm evacuated at the Noſe *nullâ tuſſi, nullo vomitu antecedente*: Which by the acute pain it produced, plainly diſcover'd where it lay conceal'd.

Whether Worms may generate in the Brain or its Teguments, I ſhall not determine: 'Tis ſufficient (ſuppoſing it

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(g) [illegible] *Sacr.*

(h) *De abditis Morb. cauſis, cap.* 100.

(i) *De Part. Morb. & Sympt. lib. 4. cap. 7.*

(k) *Prax. Med. admir. lib.* 1. *obſ.* 7.

(l) *Miſcell. Epiſt. Medicinal.* 10.

(m) *De ratione curand. partic. hum. corp. affect. lib.* 9. *cap.* 11.

(n) *Obſervat. cent.* 1. *obſ.* 8.

(o) *Epiſt. ad Fulv. Angelinum & Alſarium Crucium: vid. Crucium de Quæſitis per Epiſt. cent.* 3.

(p) *Obſervat. med. lib.* 4. *cap.* 11.

(q) *Obſervat. med. obſ.* 6.

(r) *Tho. Bartholin. Hiſt. Anatomic. cent.* 1. *Hiſt.* 64. *Epiſt. med. cent.* 2. *Epiſt.* 74 & 85. *Ephem. German. Ann.* 2. *obſ.* 147. *Ann.* 4. *obſ.* 37.

(s) *De re med. lib.* 4. *cap.* 57.

(t) *De Lumbric. cap.* 8.

(u) *Obſervat. medicinal. lib.* 21. *obſ.* 28.

(w) *Hiſt. & Obſervat. medic. cent.* 2. *obſ.* 70.

(x) *Apud Alſar. Crucium de Quæſit. per Epiſt. cent.* 3.

(y) *De Morb. intern. lib.* 1. *cap.* 54. *in Schol.*

poſſible) that there is no paſſage for them thence to the Noſe; where they are often found, as we are aſſur'd by many credible Writers. *Angelinus* and *Alſarius à Cruce* place them *prope naſi colatoria in ſtrictura narium*; both ſeeming to imply that *Sinus* more exactly deſcrib'd by (z) *Avicenna*: Which is to be underſtood of humane Heads, not thoſe of Brutes, but only as apply'd by *Joubertus*.

(z) *Loc. ſupra citat.*

What terrible Symptoms, as *Cephalæa's*, *Deliriums*, *Epilepſies*, *Syncopes*, *Convulſions*, *&c.* a Worm, with ſuch ſharp and piercing Weapons may raiſe, by continually preying and ſporting on a Part ſo exquiſitely ſenſible, and nearly ſituate to the Origin of Senſation, as the Membrane, that inveſts the cavity of this *Sinus*, may be more eaſily imagin'd than explain'd.

Oxon. July 24, 1704.

V. *An Account of very large Stones voided* per Urethram. *In a Letter from Mr* Edw. Lhwyd, *Keeper of the* Aſhmolean Muſeum *in* Oxford, *to Dr* Hans Sloane, *S. R. S.*

Oxford, Sept. 22, 1704.

I Make bold to trouble you with a Copy of a Paper I receiv'd from Dr *Bullen*, a Phyſician in *Cheſhire*, together with a figure of the Stones he mentions. They are much of the ſame ſize and ſhape; and being joyn'd together, the circumference one way is above three inches and a half, and the other three and a quarter, (*See Fig.* 10.) The perſon that voided them, took an exceſſive quantity of Honey during his pain; to which alone he attributes his Deliverance; how probably you can beſt judge.

Ne fortè ea, quæ veriſſima eſſe ſcio, pro veriſimilibus tantum habeantur, vel de re in his Finibus tam notâ & apertâ, ulteriùs ambigerent Extranei, ſi quid ipſe in ſuadendo Valeam, poſtulatus aſſero, teſtorq; —— in agro Ceſtrienſi, loco non longè a vico Malbano diſlito, quendam Thomam Olton annum jam ſeptuageſimum octavum, & quod excurrit, agentem, hominem ſane probum, & tam re quam famâ Spectabilem, per multos retrò annos vixiſſe: qui quidem Vir cùm veſicæ calculo gravitèr cruciatus eſſet, opem a me aliiſq; Medicis circumdegentibus non ſemel petiit; eratq; a nobis variis medicamentis pro rei exigentiâ, ſed inutiliter tractatus. Tandem verò in uno paroxyſmorum, præ omnibus aliis atrociſſimo, calculos duos, benedicente Numine, per Urinæ ductum excrevit; æneis iſtis ab ornatiſſimo Viro R. W. Armigero Muſæo Oxonienſi nuperime miſſis, quoad figuram exactè quadrantibus; & archetypis, quæ ſupra drachmas duas ſeperatim pendebant, per omnia (gravitate exceptâ) reſpondentibus.

Calculum primò egeſtum dolor ferè intolerabilis comitavit, ſecundum verò vix ullus, qui moleſtiæ ſenſum crearet; nec mirum, ſi Urethra a lapide priùs emanante adeo diſrupta, & lacerata, alteri jam tranſituro facilem & patentem præberet exitum. Duo autem hi calculi, unum aliquando in veſicâ conſtituebant; quòd ex fracturæ, ſi committantur, convenentiâ, palam eſt. Iſta via, ex neglectâ Chirurgiâ jam uſq; patet; cui quidem incommodo Cornu peramplo, radici penis aptato, quoties Urinam mittit conſulere coactus eſt; ne ſecùs tam ſua, quam adſtantium veſtimenta inter mingendum, inquinaret.

Hæcce quæ dico, non tantùm mihi, ſed toti Perichoro conſtant, adeò ut penès quemlibet eſſet me falſitatis arguere, ſi quid a veritate alienum pronunciare ſuſciperem. Sed (Diis gratias) ſi me rudem Natura, non vanum & mendacem improba finxit; de prædictis itaq; fidem præſtare non gravabor.

T. Bullen.

Si tamen Extiterit aliquis ingenii adeò lividi & Sceptici, ut præmiſſis fidem detrahat; conſulat velim Clariſſ. Schenkij Obſervat. cap. de calculo veſic. et tum ſorte concedat me non planè ἀδύνατα & ἀσύστατα hic loci tradidiſſe.

Malbani, Jun. 15. 1704

VI. *An Experiment made at a Meeting of the* R. *Society,* Decemb. 20. 1704. *Of firing Gun-powder on a red hot Iron in* Vacuò Boyliano. *By Mr* Fr. Haukſbee.

THe Candent Iron being included in a Recipient proper for that purpoſe, and the Air withdrawn (which was in about two minutes of time) the Mercury then in the Gage ſtanding at 29 inches $\frac{1}{2}$, a quantity of Gunpowder was made immediately to deſcend upon the red hot Iron, which continu'd upon the ſurface of it ſome ſmall time before it went off, and then was obſerv'd not to fire all at once; and the laſt of the Quantity that did ſo, ſeem'd to give the greateſt flaſh: Upon which, the Mercurial gage was taken notice of to deſcend ſomething more than an Inch, it riſing again $\frac{3}{10}$ of the ſame. And upon ſeveral Repetitions of the like quantity of Powder (the factitious Air being always firſt withdrawn) the Appearances were very reſembling. Again, upon Purging the Recipient of the factitious Air, and the Mercury elevated in the Gage as at firſt, three quantities were caus'd to deſcend upon the Iron, whoſe Exploſion, as well as the Air produc'd from them, ſeem'd in proportion to the quantity of Powder: The Mercury then in the Gage ſubſiding to 25. But upon dropping 6 Quantities (the Recipient being firſt purg'd as before) which Quantities not deſcending all at once, but ſucceſſively as faſt as might be, the

Quantities that firſt reacht the (ſtill Ignited) Iron taking fire, by their flame making an Exploſion of the whole, at once blowing up the Recipient, altho the weight of Air incumbent on it was equal to 144 *l.* ½, accounting the Receiver at 3 inches ½ diameter, but was ſomething more, which does ſufficiently allow for the want of height of Mercury. The Gage then ſtanding at 29 ½, inſtead of 30, from which the Calculation is made. The Gunpowder us'd was the common Glas'd ſort; and the weight of the ſix quantities, which remov'd the Recipient, with ſo great a Preſſure incumbent on't, was but 7 grains, each Quantity weighing ſomething more than one. I did not obſerve the Recipient to be broke before it reach'd the Floor. It was thick lin'd with Sulphureous and Nitrous Steams, ſo that the flaſhes of Fire thro the Clowdineſs of the Glaſs ſeem'd very much to reſemble faint Lightnings. The Content of the Receiver was equal to about 25 ounces ½ of Water, allowing for the Bulk of Iron and Pedeſtal.

VII. *An Account of an Experiment made* Decemb. *the 26th,* 1704. *To try the Quality of Air, produc'd from Gunpowder, fir'd in* Vacuo Boyliano. *By Mr* Fr. Hauksbee.

UPon making the late Experiment of firing Gunpowder in *Vacuo*, it was hinted as well worthy of tryal, Whether the Factitious Air of fir'd Gunpowder was endu'd with any Quality differing from Common Air. In order to the ſatisfaction of the Query, On *December* the 26th about noon I included a Candent Iron in

Vacuo, the Mercury then in the Gage ſtanding at 29 inches $\frac{1}{2}$: Upon dropping the firſt quantity of Powder, (by a quantity is to be underſtood ſomething more than a Grain weight) its Exploſion made a Deſcent of the Mercury in the Gage about an Inch, undulating very little. The ſecond quantity being let fall, the Mercury ſubſided about $\frac{3}{4}$ of an Inch; and ſo for ſeveral quantities following it deſcended by pretty equal Stages, till it had faln about 6 or 7 Inches; and it was obſerv'd, upon every quantity fir'd, the Undulations of the Mercury increas'd. But after it had ſubſided 6 or 7 Inches from 29 $\frac{1}{2}$, the ſeveral deſcents of it became leſs, very little or nothing exceeding [illegible] an Inch, altho the Quantities fir'd were equal; but ſtill the Undulations encreas'd, and the Exploſions manifeſtly did ſo too: Till at laſt the Receiver ſeem'd to be in great danger of being blown up by a ſingle Quantity, the Undulations of the Mercury being then augmented to 6 or 7 Inches. Now 26 Quantities or 32 Grains having been fir'd upon the Iron, and the Mercury in the Gage faln to 12 $\frac{3}{4}$, I diligently attended to obſerve the Gage, which in 7 minutes had aſcended 2 Inches $\frac{1}{4}$, the next 5 minutes it aroſe but once Inch $\frac{1}{4}$, and ſo leſs ſucceſſively every 5 minutes, that in an hour and 17 minutes it had attain'd but to 21 Inches, the Iron not being quite cold. At 9 the ſame night I obſerved the Gage, and found the Mercury elevated to 22 Inches $\frac{1}{2}$, preciſely: next morn at 9 it had attain'd to 22 $\frac{1}{2}$, and ſo continu'd all that day, the Iron then being reduc'd to the temperature of the outward Air. So that from 12 $\frac{3}{4}$ to 22 $\frac{1}{2}$ ſeems to be the weight or ſpring of heat equal to about $\frac{1}{3}$ of an Atmoſphere of Air, which would preſs the Mercury upon the upper part of the Gage, but equal to ſuch a degree of heat as was then contain'd in the Receiver, when the Gage was faln to 12$\frac{3}{4}$; The remaining ſpace from 22 $\frac{1}{2}$ to 29 $\frac{1}{2}$ is ſuppos'd to be ſupply'd with factitious Air, and anſwers to about $\frac{1}{4}$ part of the Recipients whole Content, which was equal to 25 ounces ½ of Common Water, allowing for the Iron and Pedeſtal. This Air, produc'd from Gunpowder, I find to be actuated by heat and cold as Common Air: For, holding my warm Hands upon the Receiver, the Mercury in the Gage would immediately deſcend, and riſe again when reduc'd to the temperature of the outward Air. This I repeated ſeveral times, with the like ſucceſs. What more occurs in this Experiment is, Why the Exploſions of the like quantities of Gunpowder ſhould be greater when Reſiſted by Air, than in *Vacuo*, where nothing ſeems to hinder the Extention of their flame.

VIII. Georg. Joſeph. Camel. *De Plantis* Philippenſibus *Scandentibus*; *Pars Tertia.* *Ad* Jacobum Petiver, *S. R. S.* *nuper tranſmiſſa.*

106. C*Occulus Piſcatorius Levanticus*, ſeu *Orientalis*, Indis *Lagtan*, *Lactan*, *Libtang*, *Lingtangbaguin*, *Talatalaroan*, *Soma* vel *Suma*, *Lanta* & *Tuba.* Univerſas *Indias* plurimis, maximiſque abundare volvulis, omnibus, qui *Indias* adierunt, conſtat: Ad quod, ut opinor, plurimùm facit continua illa, & *Indijs* plerumq; omnibus communis, continuò vernans, & ſemper florens *æſtas.* Hinc in *Luzone*, *Roſa*, *Malva* utraq; *Belmuſcus*, *Tuberoſus*, *Hyacinthus*, *Pancratium*, *Matricaria*, *Gumamela*, *Stramonium*, & nonnullæ arborum, nullo ſervato ordine aut tempore perpetuò florent. *Ruta*, *Majorana*, *Cheyri*, *Betonica*, *Mentha*, *Faba*, *Cicer*, *Braſſica*, *Carduus Benedictus*, & alia *Europæa* nunquam florere viſuntur; ſed ſtatu florem laturo, nova à radice protrudunt germina, ulteriori inſervientia propagationi: Hinc *Balimbin*, *Gamia*, *Papaya*, *Palan-*

Palantang, *Zapote*, *Caxel* & aliæ arbores ferme ſemper & flore, & fructu maturo, immaturòve onuſtæ conſpiciuntur. Hinc multæ Herbarum fruticeſcunt, ut *Fagaria*; Frutices arboreſcunt, ut triplex *Sambach* Arabum; plantæ aliæ in Volvulos excreſcunt arboreſcentes (quos *Bexucos* vocant; de *Bexuco* autem *Arundine*, & ita propriè dictos ſcripſi inter *Plantas humiles*, titulo *Arundinis farctæ*) vicinis altè, longèq; ſeſe inſternendo: Ex quorum numero & cenſu noſtra eſt planta *Cocculos levanticos*, ſeu *Baccas* ferens *piſcatorias orientales*, quæ *Radice* ſerpit longiſſimâ, craſſâ pro proportione plantæ. *Sarmentis* ſimiliter longiſſimis, quibus Arbores altiſſimas ſcandendo ſuperat; et, ut ferunt, nonnunquam centum Orgyiarum; craſſis uncias quatuor, & ſæpe brachium; ſcabris, ſubfuſcis, facie junioris *Quercûs*; horum, & radicum lignoſa materies levis eſt, corticoſa, poroſa, flavens, tingens, amara, ſubadſtringens, facilè friabilis aut raſilis, & tranſverſim diſſecta, triplici aut pluribus, aſſulatim, radiatimq; parallelis ferme circulis diſtincta. *Folia* ſubrotunda in mucronem abeuntia, ſpithamea, aut pedalia, quinquenervia, per remotiora intervalla, ſpithameis alternatim appenſa pediculis. *Florem* aiunt exiguum eſſe, & candidum. *Fructus* in racemum congeſtus, ſat notus, de quo vide *Schroderum* in *Appendice*. Indi *Bayoti*, & *Talatalaroan* vocant, ob *Baccas* plurimas ſimul conglomeratas, quæ maturæ rubent, & in bicubitalibus racemis creberrimæ congeruntur, unde quandoque libræ ſex baccarum ex unico racemo colliguntur. *Radix* tantæ eſt æſtimationis apud *Indos*, ut vulgo *Radix omnia Sanans* audiat. Datur raſuræ *Radicis* aut *Sarmenti* ʒß, internè in diarrhæâ, inappetentiâ, concoctione læſâ, ciborum indigeſtione, ſeu cruditate, & exinde ortis ventris, & ventriculi cruciatibus, flatibus, colica. In peſte item, morbis contagioſis, Febribus malignis, intermittentibus, veneni periculo, Morbo Gallico, & obſtructionibus inſignioribus profuit *Petro de Sylva*, reiteratò datus potus ex Scobis Cort. Orient. *Suma*, *Caynt-*

na, *Alagao*, *Tumahela* aa ℈ß *Macayza* gr. jjj. M. Deſoris imponendo Cataplaſma ex ijſdem *Sulphure*, *Aceto*, & *Oriza nigra* commixtis. Decoctum aut infuſum radicum viſum clarificat. Scobs vulneribus recentibus inſperſus ea cicatrizat, Ulcera humentia deſiccat, ſordida et putrida mundificat, detergit, & ſanat. Fructus *Bauhinus* contra pediculos, ad Podagram in, cataplaſmate *Riverius*, pro piſcatione medica *Zacchius Botanici*, & omnis *India* commendat. Attamen remedium magis efficax ad interimendos Crocodilos *Caymanes*, hujates *Indi* non habent. *Piſcationi medicæ deſervit* Cocculus piſcatorius orientalis. *Pinea Molucana*, ſeu *Curcas*. Fructus Arb. *Calbungan*. Nucleus fructûs tetragoni C. Cluſii, *Bitoon*. *Camayſa*, *Lugmon*. Folia *Apocyni* No 7. & 13. ſeu *Tibalau*, & 16. ſeu *Tuble*. Fruticis *Burao*, *Tigao*, *Culiſao*.

Lactang flavo tingens ſarmentum in mentem revocat *Gumi guttam*, quam *Sinarum* Vulgus *Tienng*, Mandarini *Thiengjuan* vocant, id eſt *Flavum Convolvuli*, cujus autem convolvuli neſcio. *Folium* pani *Gumi guttæ* impactum habui, bipalmum amplum, nervi à medio rectè excurrentes plures, & conjugati erant, parte ſupernâ fuſcum, infernâ alba obſitum lanugine, pediculus brevis. Unà cum hujus folij fragmento adhæſerat ſeminis putamen, nigrum, terſum, craſſiuſculum, & coronidis loco quaſi foraminulatum, ſimile putamini glandis *Colocaſſiæ*, & à Cocculi orientalis diſtinctum.

107. *Lactang altera*, Foliis, & fructibus luxuriat multò habetioribus. Fig.

Sect. IX. Scandentes *Juligeræ*.

108. *Piper longum uſuale* 1. Indi *Cagaſcas* vocant; fert Fi *Folia* oblonga, ferme palmum lata, & vix non palmos duos longa, ſed & majora, aut minora, alternè exeuntia, nervis longioribus a medio procedentibus exarata, ſed minùs luculentis, quam *Buyiocbuyioc*, ſerventia, ſubamara,

atro virentia. *Fructus* ſeu *racemoſus Julus*, ut ſiccetur, colligitur immaturus, viridis, & antequam efloreſcat; floridus molleſcit, & flaveſcit, & crudus editur, aut aceto maceratur in acetarij. Provenit autem ſingularis e geniculo ex adverſo folijs, ut fructus *Betele*, & *Buyiocbuyioc*. *Flos* flavus eſt, & decuſſatim appenſus.

Fig. 109. *Piper longum uſuale*, & *edule* 2. Indi *Porongnangnito* vocant. Paſſim provenit, & ſpecialiter in monte *Quadelupe*. *Folium* habet priore minus, in quo nervi à medio excurrentes plures ſunt, & breviores, alternum, & magis mucronatum, fervens, nec amaricans. *Sarmenta* ejuſdem ſaporis. *Julum* é regione folij alternè enaſcentem, craſſitudinis fere digiti auricularis, longitudinis ſeſquiuncialis, in quo *Baccæ* virides, maturæ rubentes, *Coriandro* pares, ſparſim inſident.

Fig. 110. De *Betele*, *Betre*, *Tambut Arabum*, ſeu *Itmo* optimè, & fuſè *Garcias ab Horto*. Maſticatoriam verò illam *Offam*, hujatibus Indis *Mamin*, ſeu *Buyo* dictam, ab *Indis*, & *Hiſpanis* tantopere, imo vitioſè expetitam, ex folio *Betele*, *Bonga*, id eſt *Areca*, momento calcis ex *Oſtreorum* teſtis factæ, & tantillo ſeminis *Damoro*, id eſt *Dauci Cretici* componunt. Quod *Buyo* ne unquam deficiat (multi etenim cibo potiùs aliquamdiu, quàm *Buyo* abſtnere malunt) ſtatutis diebus ex Lacu *Baij*, ubi plurimum colitur, *Manilam* certa navicula (præter quotidianas, incertas, & minores) folio *Betele*, & fructu *Arecæ* onerata venit. In tantum autem uſus, vel potiùs abuſus *Buyo* ſuccrevit; ut *Manilæ* ſumptus in *Betele* annuè ultra centum, & quinquaginta millia imperialium excurrant.

111. *Betule edulis ſpecies altra*. Omnes autem *Betele* veſci, uti & *Buyiocbuyioc*, ſeu *Betele* ſylveſtris medicinalis ſpecies, ſpecies ſunt *Piperis longi*, in umbroſis, lento reptatu, arbores Scandentes.

112. *Betele Maſticatorium*, ſeu *edule* 1. Indis *Itmo*. Reperitur duplex, Sarmenti rubri, & Sarmenti albi. Hoc Byſaiæ *Caninguguin*, id eſt *Cinamomeum*, illud, ſeu Sarmenti rubri *Catuanen* vocant: utrumq; valde aromaticum eſt,

optimum præ cæteris, & laudatiſſimum ; majoris tamen virtutis *Indis* ſunt Sarmenta. *Folia* habet lata, ut *Piper nigrum*, ſed magis tenera. *Fructus* exſiccatus, aut etiam Sarmenti fragmenta, foliorum loco deſerviunt in itineribus tranſmarinis.

113. *Betele Maſticatorium alterum*, Indis *Malaitmo*. *Folium* minus, minùs fervens, & maſticatum neſcio quid dulcedinis, & Saporis *Aniſi* reſipit. Hoc æſtimatur à fœminis.

114. *Betele veſcum* 3. Indis *Litlit*, *Saog*, & *Sanguilo* ; in *Malabar*, & *Malayo Malabetre*. *Folium* fert magnum, oblongum ; *Fructum*, ſeu *Julum* cinereo virentem, Julô *Betele legitimi* tenuiorem, & pipere longo duplo longiorem, aromaticum, mordicè acrem, & ſemine repletum ; quem *Poro*, & *Deling* vocant ; & pariter, ut *Julum* Piperis longi, & *Betele legitimi* aceto condiunt. Folio utuntur in defectu priorum.

115. *Betele veſcum* 4. Indis *Sabia*, & *Buyobuyo* ; Nierembergius Fig. *Tlatlamcuaye* appellat. *Folium* gerit, & *Fructum* omnium maximum, ſpithameum, nervis a medio procedentibus ſine ordine, arcuatim reflexis. *Fructus* digitum craſſus, carnoſus, ſeſquiunciâ longior, rubens maturus : in *Bay*, & *Tanauguan* vocatur *Oyon*, aut *Uiyon*.

116, 117, 118. *Betele* 5. 6. & 7. ſeu *Alagbati*, *Hunobalatri*, & *Bobon* minus aromatica ſunt præcedentibus.

119. *Betele* 8. ſeu *Ducmao* amaricat.

120. *Betele* 9. ſeu *Tolonſapa* malè olet.

Differunt ſapore, colore, magnitudine folij, & fructûs. Sapor omnibus plus, minuſve fervens & aromaticus, cum quâdam adſtrictione. Hinc halitum, & Vires fœtentem emendant animam ; adſtringendo gingivas confirmant dentes ; confortant ventriculum ; reprimunt nauſeam, & vomitus ; famem minùs moleſtare, & dolores quoſcunq; minùs ſentire faciunt maſticata per ſe, vel cum *Arecâ*, & concyliorum calce : inebriant etenim inaſſuetos. *Betele* compoſiti maſticati rubens *ſuccus* vulneribus recentibus conducit, præſertim partium verecundarum. *Folium* ſub cinere coctum vertici imponitur utiliſſimè in rheumate; ventri in cholicâ; ventriculo in inappetentiâ, & doloribus á flatibus; fronti, & temporibus in dolore capitis. Succus aduſtis illitus non ſinit veſicas fieri; hydropicis propinatus aquas elutriat intercutaneas; contra venena, venenatorum animalium ictus, contagium, epilepſiam, tremorem cordis, ſcorbutum, & nauſeam exhibetur cum levamine. Vulneribus infuſus, & ipſum folium contuſum, calfactumq; ſuperimpoſitum, ea brevi cicatrizat. Succo *Betele* Byſaiarum *Indi* olim defunctorum corpora ſolebant condire.

Buyobuyo, vel *Buyioebuyioc* vocant alias ſpecies *Betele ſylveſtris*, non veſcas, medicinales. *Buyobuyo*, id eſt *Buyo pumilum*, alijs *Itmonahas*, id eſt *Buyo Simiarum*.

Fig. 121. *Primum*, & minimum *Foliola* gerit vix uncialia, aut ſeſquiuncialia, formæ cordis bene effigiati. Gaudet Saxoſis: Saporis eſt acerrimi.

122. *Secundi* folia Piperis longi folijs minora; *Sarmenta* nigra, & aſpera; ſaporis ferventioris *Buyo legitimi*.

123. *Tertium* piper ſapit; *Sarmenta* viridibus maculis variegantur.

124. *Quarti* Sarmentum primò *Betele* ſapit, mox amaricat.

125. *Quinti*, Sarmenti color extimus luteus, intimus palearis; *cortex* craſſus, ſpongioſus, amarus cum ſtypticitate.

Fig. 126. *Sextum* longâ ſerpit *radice*, ut Piper longum; & pariter longis ſcandendo repit viticulis, crebrò geniculatis; ad quæ alternatim exeunt *folia*, Piperis longi modo oblonga, ſed ſeptem luculentioribus nervis diſtincta, morſicantia, ut piperis longi.

Vires. Omnes *Buyobuyo* ſpecies varijs deſerviunt remedijs: adduntur medicamentis alexipharmacis; imponuntur in cataplaſmate utiliter Membris ſyderatis, ventriculo in vomitibus, dolore, diarrhœâ per ſe, vel cum alijs; in impotentiâ ex philtro propinatur pulveris radicum quinti ad ʒj cum aquâ cinamomi ; vulneratis verò ſagittis intoxicatis cum marinâ, vulneratis à viperà cum *Manulgal*, & vulneri imponitur.

127. *Betele Monſtroſum fatuum* vocabimus plantam, Fig. quam Indi *Tampinbanal*, *Bilaco*, *Tirbatib*, vel *Dibatib*, *Dalicucup*, *Balicucup*, *Pacpaclavin*, *Daiya*, *Malapacpacbalavay*, id eſt *Betele Milvi*, *Tarhan*, *Tacoling*, & *Horog* vocant ob ſimilitudinem fructûs, etſi monſtroſum. Videtur autem eſſe *Lignum Colubrinum*, *Hederaceum*, *folijs Bryoniæ Acoſtæ*. Vide Sciagraphiam Stirpium *Dom. Chabræi* fol. 123. *Folia*, qualia *Chabræus* deſcribit, cubitalia, & ſeſquicubitalia. *Radix*, ſeu mavis ſarmentum craſſum 4 aut 8 unciarum, geniculatum, virens, terſum, ad genicula radiculas emittens, ut *Betele*. Utuntur radice ad dentes denigrandos, ut apicibus arboris *Tariſay*, ſeu *Hitam*. *Fructus* eſt Spithameus, oblongus, coloris ex cinereo viridis, totus teſſellatim ſquamoſus, ut fructus *Athe*, compactus ex dentibus, ut fructus *Nino*, ſtrobilus. Folio ſub cinere cocto utuntur utiliſſimè in juncturarum diſlocationibus, doloribus ex luxatione, & tumore teſtium ; vocant *Tampus*, ſeu *Haclup* ipſam plantam, id eſt cataplaſma, ab uſu, cui deſervit. Sarmento vires *Guaiaci* tribuunt, & ad Hydropem commendant.

Sect. X. Scandentes, *flore campanulato, & plura ſemina in uno pericarpio habentes.*

128. *Smilax lævis*, ſeu *Liguſtrum album majus Luzonis*, Fig. *Lactaria Meznes*, *Scammonij*, aut *Mechoacæ* Species, Indis *Togdalag*. Altiſſimè autem quàm plurimis, longiſſimiſq; ſcandit *funiculis*, rubentibus, verrucoſis, ſeu nodoſis. *Folium* alternum ad ſummitates proveniens amplum eſt, rotundiuſculum, & in mucronem deſinens, ut folium *Mechoacanenſis Volvuli*, aut *Scammoneæ Monſpelienſis*, ſed alterum, non conjugatum : Magis autem adulta folia, alia quaſi *Campanæ cæruleæ* evadunt tricuſpidata, alia quinque-

lobata, ut folia *Bryoniæ*. *Flos* magnus, candidus, campanulatus, ut flos Stramonij, bipalmum hians, adaperitur noctu, interdiu ſolis marceſcit calore, quo à *Convolvulo Bonæ noctis* differt: Ex ſpithameo tubo umbilicus, & quina ſupereminent ſtamina, crocis faſtigiata. *Semen* in vaſculis, qualia *Convolvuli Bonæ noctis*, oblongum, nigrum, albâ, ſpongioſâ, & dulci, uti eſt fructus *Chamochili*, obvolutum maſſâ. *Radix* longa, comata cirris. Cæterùm tota copioſè lacteſcit planta. Uſûs nullius, quod ſciam; *Chabræus* Smilacem lævem reſolvere, maturare, detergere, & aperire ſcribit.

129. *Smilax lævis*, ſeu *Liguſtrum album alterum* ex Java allatum; cauliculos impellit pauciores, nec rubentes, nec verrucoſos. *Folia* tantummodo ſubrotunda. *Flores* ſimiles etiam prioris, ex prælongo, graciliq; tubo in calathum quinis hemicyclis radiatum abeuntes, præcoces, crebriores, & ſuaveolentes; verùm ſimiliter, ut *Convolvuli Bonæ noctis*, contrario modo, noctu videlicet dehiſcunt, oriente ſole marceſcunt. *Semen* eſt album, oblongum, ut prioris, in vaſculo ex rotundo mucronato. *Radix* alba, cirroſa.

Fig. 130. *Smilax*, ſeu *Liguſtrum Luzonis cæruleo-purpureum*. Sarmentoſo-lignoſis virgultis arboribus innectitur, & irretitur. *Folia* alterna, ſubrotunda, obtuſa, palmaria, craſſa, hirſuta & incana. *Flos* palmaris eſt Campana, dilutâ tinctâ purpurâ; & ſtellâ candidâ, ac hirſutâ gratioſâ diſcriminata. *Vaſculum* folliculoſum, orbiculare, & lacteſcens, anguloſa & nigra habet ſemina.

131. *Campana purpureo-violacea* fluvij *S. Petri*, Indis

132. *Campana nitidiſſimè cærulea*. Indis

133. *Smilax*, ſeu *Liguſtrum Luzonis flavum*, Viticulos habet lacteſcentes; *folia* palmaria, alterna, hederacea; *florem* uncialem campanam, flavam, decem hemicyclis limitatam; *Semen* parvum in orbicularibus vaſculis.

Fig. 134. *Campana alia*, ſeu *Convolvulus albus minor*. Planta tota ſubhirſuta, vix lacteſcit: *Folia* palmariâ, & majora, ex ſubrotundo mucronata: *Flos* campanula ſolem ſuſtinens,

decem hemicylis marginata, pallida, cujus Stella flaveſcit, infundibuli autem umbo atrè purpuraſcit: *Semen* in orbiculari, & ſeſſili nodo, foliolis inſidente, quaternum, quaſi ex triangulari lenticulare, dilutè fuſcum, durum.

135. *Gulingulin* Volvulus, vel *Campana* lacteſcens. *Cauliculos* ſpargit crebros, triquetrè criſtatos, rubentes, vietos, & pertinaces. *Folia* ſunt hederacea, alterna, mucronata; *Semen* grana nigra magnitudine Piſi, communiter quatuor in uno pellucido, & tenuiſſimo pericarpio, quinis convexis, & majoribus inſidente alabaſtris.

136. *Campana flore congeſto prima.* *Folio* luxuriat hederaceo, pubeſcente, vario, ſubrotundo, oblongo, aut tricuſpidato. *Semen* nigrum, anguloſum, piloſum, in pericarpijs ſimilibus *Campanæ Lazureæ*, quinqueungui inhærentibus caliculo, ſed non ſparſim, ut in illâ verùm in corymbum majorem ex ferme 80 aut 90 congeſtum. Fig.

137. *Altera* ſimile huic gerit folium, uti & ſeminis pericarpia in Corymbum congeſta, at minora; & ſemen cinereum minus, & pilis carens.

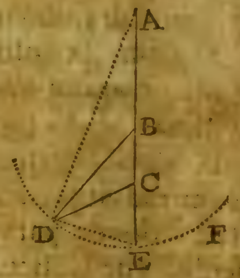
148. *Campana alba folio heptaphyllo.* Incana eſt Planta, & villoſa. *Folia* alterna, in longis pediculis, in ſeptem diviſa lobos; é quorum regione *Flos* campanulatus, albus decem radiatus hemicylis, et Stella quinq; radiorum ornatus. *Semen* parvum, et nigrum, in duplici, folliculoſo vaſculo, aut Calice.

IX. *The-*

IX. *Theorema Spherico-Catoptricum Univerſale. Per D.* Humfredum Ditton.

Focorum Inventio tum in Dioptricâ, tum in Catoptricâ, ex Calculo pro curvis Cauſticis facili modo ſequitur. Nil enim aliud agendum eſt, quam ut locus in quo Radius (ad Curvam, vel Refringentem, vel Reflectentem perpendicularis) Curvam Diacauſticam vel Catacauſticam tangit, cognitus habeatur. De quâ methodo videatur D. *Hayes* Liber Fluxionum nuper editus: nos ex aliis principiis, rem (ad Catoptricam quatenus ſpectat) aggrediemur.

Sit DEF Speculi Spherici concavi portio, cujus Centrum *B*, ſemidiameter BE vel BD. Sit etiam *A* punctum radians in axe collocatum, a quo profluat radioſa linea AD, quæ ad punctum *D* reflectatur in DC. Inveſtiganda jam eſt Foci *C*, a ſpeculi vertice *E* diſtantia.



Notandum vero, quod punctum *D* ipſi *E* proximum ſupponimus. Radii enim remotiores oculum (quem in axe *A E* conſtituimus) præterlabuntur, nec ad imaginis viſionem aliquid faciunt. Porro, propter arcum DE indefinite parvum, anguli DAB, ADB (ut & ipſorum ſumma DBC) ſunt quam minimi, ac idcirco eandem habebunt inter ſe rationem, quam ipſis latera oppoſita: quo ratiocinii principio poſito, ad Theorema Dioptricum pervenit, D. *Halleius* Geometriæ Profeſſor apud Oxonienſes.

Hiſce premiſſis, ſit $AB = b$. $BD = BE = r$. $BC = z$. CE ($= r - z$, ſed brevitatis cauſa ponatur) $= f$. Quan-

Hiſce

titates *b* & *r* cognitæ ſunt (dantur enim ſemidiameter ſpeculi, ac puncti lucidi a vertice diſtantia) *z* vero & *f* quæſitæ ac incognitæ. Jam in Triangulo DAB, erit $\angle$ DAB : $\angle$ ADB :: *r* : *b*. Item in Triangulo DBC, $\angle$ BDC = $\angle$ ADB, ex naturâ Reflexionis, & $\angle$ DBC = $\angle$ DAB + $\angle$ ADB, ex Elem. Eucl. Ergo cum $\angle$ DBC ſit ut r + b, & $\angle$ BDC ut b; erit etiam $\angle$ DBC : $\angle$ BDC :: r + b : b, & (quod ex principio ſupra memorato conſequitur) DC : BC :: r + b : b. Sed quoniam punctum *D* ipſi *E* proximum eſt, erit DC ipſi CE equalis eſtimanda, ergo CE : BC :: r + b : b; hoc eſt f : z :: r + b : b, & (comparando Antecedentium & Conſequentium ſummas ad Antecedentes) f + z : f :: r + 2 b : r + b; ſed f + z = r, ergo r : f :: r + 2 b : r + b, ergo $f = \frac{rr \times rb}{r \times rb}$. Q: E: I.

Si ponatur r + b (= AE) = d, Theorema in formam contractiorem redigetur, & ſic ſtabit $f = \frac{rd}{2d-r}$. Sed utrovis modo, focorum inventioni, quæcunq; tandem ſit, vel Speculi forma, vel radiorum conditio, aptum evadet.

Coroll. I. Erit z d = d f − r f, ſive AE x BC = AB x CE, vel quod idem eſt, linea AE harmonicè dividitur in punctis A, B, C, E; nam prædicta Rectangulorum equalitas, lineæ ſecundum proportionem harmonicam ſectæ, propria eſt. Patet hæc veritas: Eſt enim $f = \frac{dr}{2d-r}$, & $z = r - f = r - \frac{dr}{2d-r}$, unde valores hoſce ſubſtituendo, Equatio manifeſta fiet. Adeo ut in omni Speculo Spherico, lineæ DA, DB, DC, DE, ſunt Harmonicales; & Punctum radians, Centrum, Focus, Vertex ſunt puncta diviſionem Harmonicam efficientia.

Coroll. II. 1^ma^ Poſito d > r; erit ex calculo f, ſive $\frac{rd}{2d-r} > \frac{r}{2}$ ſemper. Hoc eſt, ſi puncti radiantis diſtantia major ſit Semidiametro Speculi, foci diſtantia ſemper major erit quarta parte Diametri.

Item, erit $\frac{rd}{2d-r} < r$ ſemper. Hoc eſt, diſtantia foci ſemper erit minor ſpeculi ſemidiametro.

2^do.^ Si ponatur d = r, erit $\frac{rd}{2d-r}$, ſive f = r. Hoc eſt, ſi punctum radians in centro ſpeculi conſtituatur, Imago ejus ibi cum eo unietur.

3. Si ponatur $d < r$, tum ipſius f expreſſio erit vel poſitiva vel negativa vel infinita, prout quantitas 2 d quantitate r vel major eſt vel minor, vel ei equalis.

Si $2d > r$, hoc eſt, ſi $d > \frac{r}{2}$, tum punctum radians & focus ad eaſdem partes ſpeculi jacent.

Si $2d < r$, vel $d < \frac{r}{2}$, tum Imago, in axe ultra ſpeculi verticem producto, ſita eſt.

Si $2d = r$, vel $d = \frac{r}{2}$, Imago infinitè diſtat, ſive radius reflexus, axi parallelus evadit.

Coroll. III. Calculi hujus ope expeditè determinari poteſt, quomodo objecti radiantis (ſpeculi reſpectu) motui, ipſius Imaginis motus reſpondet. Sit (ut antea) Imaginis a ſpeculo diſtantia $= \frac{dr}{2d-r}$, quando objecti diſtantia eſt d. Mutetur jam utcunque objecti diſtantia, & ex d, fiat n d, quantitate n Numerum vel integrum vel fractum deſignante: & ſic loco prioris Equationis, $f = \frac{dr}{2d-r}$, habebimus pro Novo Foco aliam Equationem, $F = \frac{ndr}{2nd-r}$. Et quidem ſi n Numerum integrum exprimere ſupponatur, ſecunda hæc objecti diſtantia primâ major erit, ſi vero ſit fractus, tum minor erit primâ.

Hiſce poſitis, ſi $d > r$, & n ſit integer, erit $F < f$, id eſt, erit $\frac{ndr}{2nd-r} < \frac{dr}{2d-r}$, ſive $2nddr - ndrr < 2nddr - drr$, quod manifeſtum eſt. Hoc eſt, ſi in ſpeculo concavo objecti diſtantia major ſit ſemidiametro, tum recedente objecto a ſpeculo, Imago verſus ſpeculum accedet. Rurſus, deſignet n Numerum fractum, & tunc reperietur $2nddr - ndrr > 2nddr - drr$, ſive $F > f$. Hoc eſt, accedente objecto ad ſpeculum recedet Imago.

Supponatur jam $d < \frac{r}{2}$; ut & alia quæcunque ſit objecti diſtantia n d intelligatur ea ſemper minor eſſe quam $\frac{r}{2}$. Tum erunt $2nddr - ndrr$, & $2nddr - drr$, quantitates negative; ſive $ndrr - 2nddr$, & $drr - 2nddr$ quantitates poſitivæ. Et quidem ſi n numero integro æquetur, erit $ndrr - 2nddr > drr - 2nddr$, ſive $F > f$; ſi vero n fractio ſit, tum erit $ndrr - 2nddr < drr - 2nddr$, ſive $F < f$. Hoc eſt, ſi in ſpeculo concavo objecti diſtantia minor ſit ſpeculi Diametri quartâ parte, tum recedente objecto a ſpeculo, recedet & Imago; vel accedente objecto verſus ſpeculum, Imago etiam accedet.

Et hæc omnia (quæ calculi veſtigia premendo deduximus) Scholio unico concluſit, & in ſuâ Catoptricâ tradidit D. *Gregorius* apud Oxonienſes Aſtronomiæ Profeſſor.

Coroll. IV. In Equatione $f = \frac{dr}{2d-r}$, ſi ponatur d infinita, erit $f = \frac{r}{2}$; quæ regula eſt pro Radiis parallelis, ſive pro obobjecto radiante ad diſtantiam infinitam remoto. Idem ſequetur, poſito b infinito in Equatione $f = \frac{rr+rb}{r+2b}$.

Coroll. V. In Equatione $\frac{dr}{2d-r}$, mutato quantitatis r ſigno negativo in poſitivum, erit $f = \frac{dr}{2d+r}$; vel in equatione $f = \frac{rr+br}{r+2b}$, mutato ſigno poſitivo in negativum, erit tunc $f = \frac{rb-rr}{2b-r}$, quæ regulam exhibet pro ſpeculo verſus objectum radians *convexo.* Patet hæc mutatio ſigni; nam ſicut in ſpeculo concavo $d = r + b$, ſic in convexo $d = b - r$.

Coroll. VI. In ſpeculo convexo (ſtantibus quæ ad Cor. III. annotavimus de Concavo) patebit quod (ſi n ſit numerus integer) $2rndd + ndrr > 2rndd + drr$; & (n fractione exiſtente) quod $2rndd + ndrr < 2rndd + drr$. Hoc eſt, quod recedente objecto a ſpeculo, vel verſus idem accedente Imago ſimiliter recedet vel accedet.

Patet etiam in ſpeculo convexo, objecto ad immenſam uſq; diſtantiam retrocedente, Imaginem tamen illius non ultra Diametri partem quartam abire a vertice, ſed ibi, in puncto, centrum inter & verticem medio, ſe ſiſtere. Poſito enim d vel b infinito, erit $f = \frac{dr}{2d}$ vel $\frac{br}{2b}$, id eſt (utrovis modo) $= \frac{r}{2}$.

Hiſce adjungi poteſt & Problematis Catoptrici ſolutio, *Radiantis poſitionem reſpectu ſpeculi dati talem invenire, ut radians ad ipſius Imaginem a ſpeculo factum, datam habent rationem.* Sit Ratio data $r : q$. & ſymbolo O deſignetur Objectum, I Imago, d diſtantia objecti, & f imaginis a ſpeculo. Jam (quod demonſtravit D. *Greg.*) erit $O : I :: d : f$, (hoc eſt Objectum & Imago ſunt diſtantiis ſuis a ſpeculi vertice directè proportionales) & quoniam requiritur ut ſit $O : I :: r : q$, debet etiam eſſe $d : f :: r : q$, vel (ipſius f expreſſionem ſcribendo) $d : \frac{dr}{2d-r} :: r : q$, unde $2ddq - rdq = rdr$, & $2dq = rr + qr$, & $d = \frac{rr+rq}{2q}$. Unde quoniam $dr = \frac{rrr+rrq}{2q}$, & $2d - r = \frac{rr}{q}$, erit etiam f ſive $\frac{dr}{2d-r} = \frac{rrr+rrq}{2q} : \frac{rr}{q} = \frac{qrrr+qqrr}{2qrr} = \frac{r+q}{2}$, quæ eſt ipſius f, ſive imaginis a ſpeculo diſtantia, huic objecti diſtantiæ congrua. Ergo ſi ſtatuatur objectum ad diſtantiam $\frac{rrxrq}{2q}$, ipſius Imago facta ad diſtantiam $\frac{r+q}{2}$ ei comparata, eandem habebit rationem, quam $q : r$, ſive erit $O : I :: r : q$. Nam $O : I :: d : f :: \frac{rr+rq}{2q} : \frac{r+q}{2} :: r : q$. Q: E: I.

Objectum Radians & Imaginem hic tanquam lineas conſideravimus. Si enim Superficies ſunt, tum erit $O : I :: d^2 : f^2$, & $d^2 : f^2 :: r : q$, ſic ut ultimo deveniatur ad Equationem $4dd - 4qdr = r^3 - qrr$, e quâ radicis d valor, Methodis vulgaribus facillimè inveniri poteſt.

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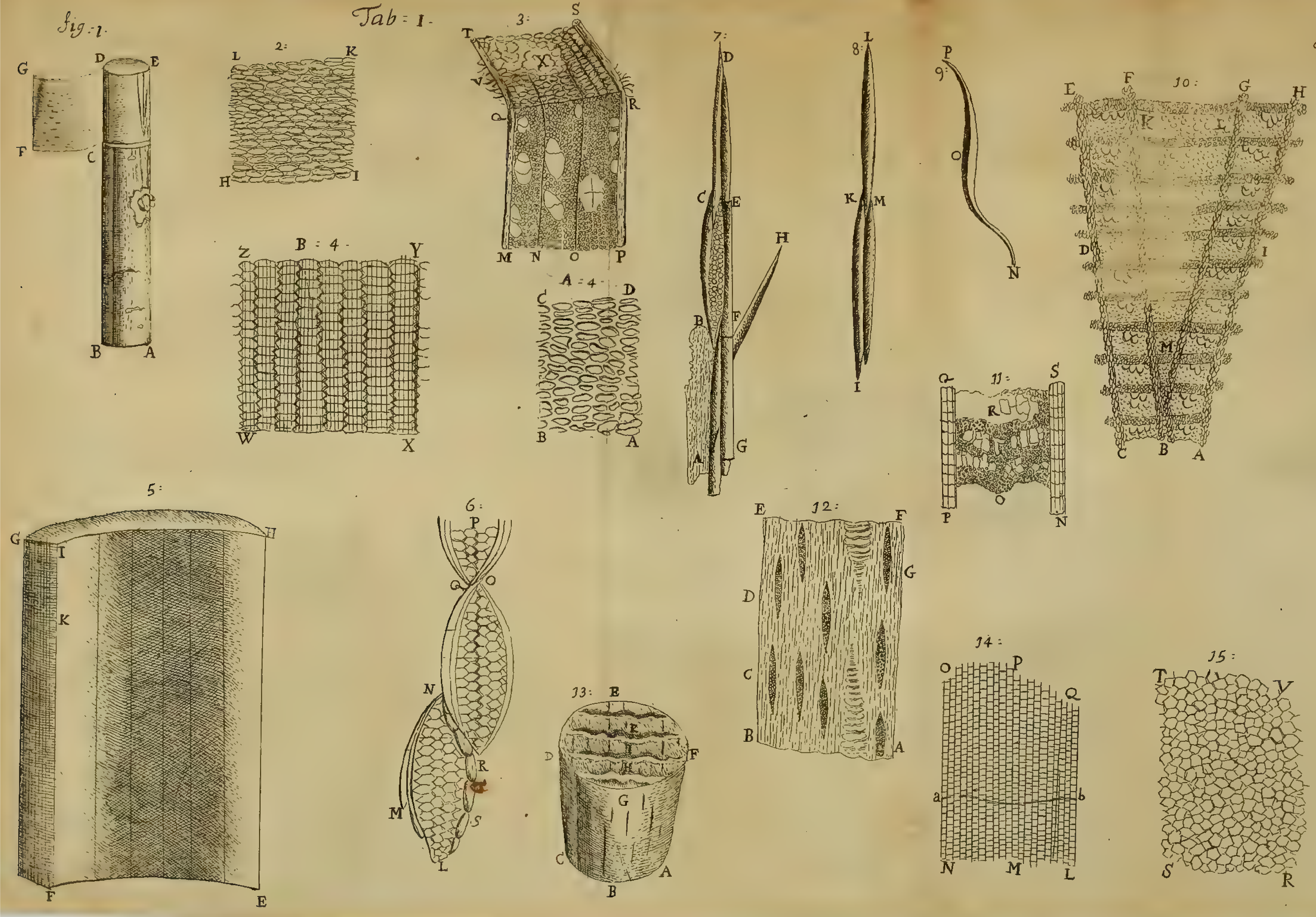
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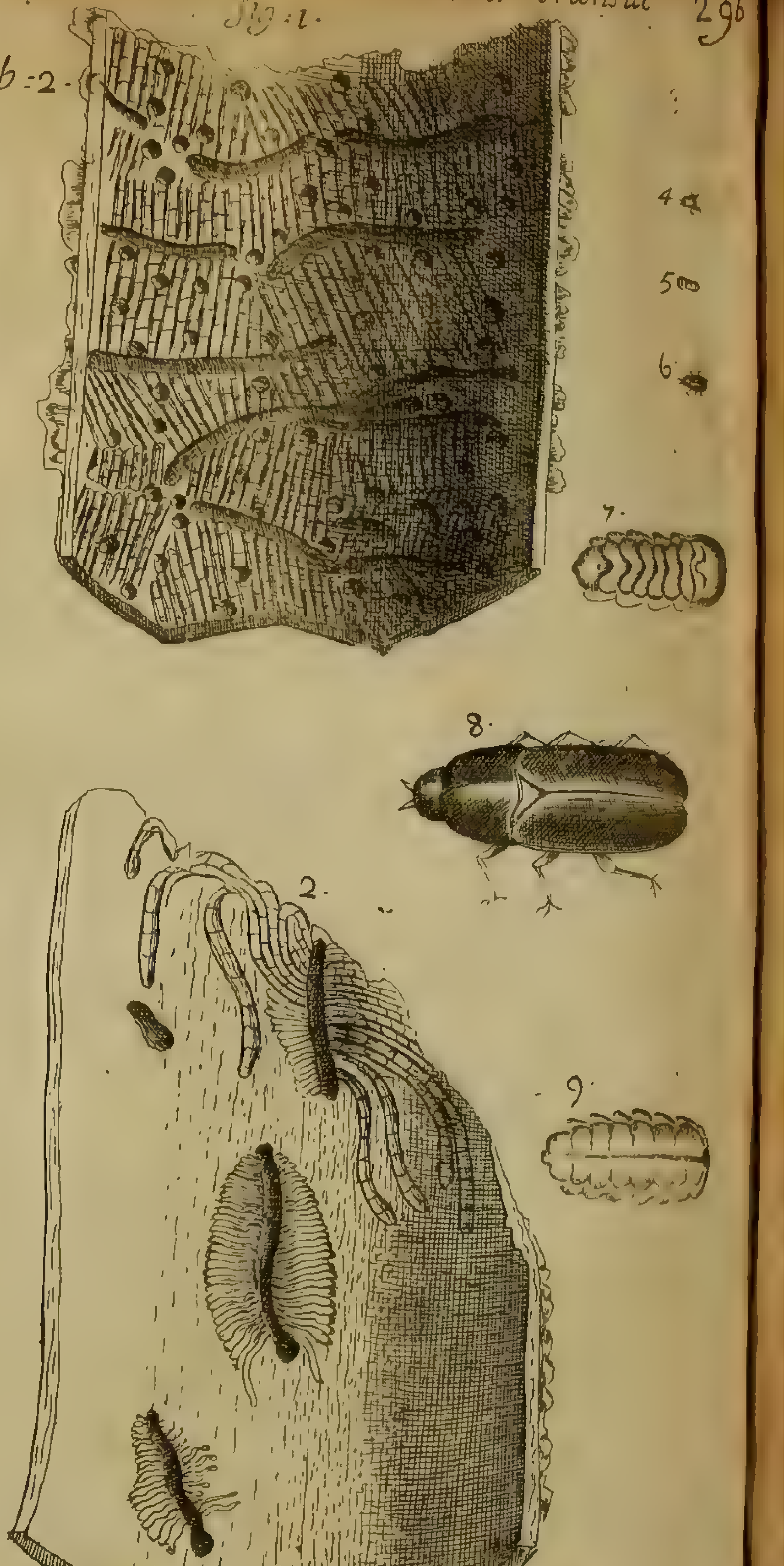
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For the Month of February, 1705.

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Fig. 139. *Cantong* & *Tangcong* Indorum, ſeu *Braſſica Marina prima. Soldanellam officinarum* Botanici plerumq; omnes *Braſſicam* faciunt *Marinam* Dioſcor: Ipſe bonâ tantorum, & optimè de re medicè meritorum virorum veniè, plantam in Luzone *Cangcong*, & *Tangcong* vocatam *legitimam* Dioſcoridis *Braſſicam Marinam* eſſe cenſeo; utpote quæ adæquatè cum deſcriptione Dioſcoridis *Braſſiæ Marinæ* convenit, & inſuper notam, quæ in *Soldanellâ officinarum* deſideratur, folia ſcilicet longa, & tenuia, habet. *Cangcong* pono, ſeu *Tangcong*; ad maris littoralia, & ſpecialiter in fluviorum brachijs aquâ marinâ mixtis abundè provenit, prout & in *Lacu Baij*; verùm & in hortos tranſlata citiſſimè adoleſcit, & vitioſè propagatur. *Viticulis* inanibus, & fiſtuloſis, quæ crebrò radices agunt, ſerpit, mollibus, & aliquando rubentibus, pauca ſucco lacteo prædictis, ut folia. *Folia* ſingularia, pinguia, oblonga, & anguſta, mucronata, & aliquando ad imum paulò ampliora, & nonnihil dentata, ſaporis ex ſalſo amariuſculi. *Flos* campanulatus ex cœruleo purpuraſcit; ad *Indicæ campanulæ*, aut *Ægyptiaci Convolvuli* florum figuram accedit. *Semen* fuſcum, & binum, in ſimili, ſed minori *Scammoniæ noſtræ primæ* vaſculo. Vires. Uſus hujus *Cangcong* eſt, ubi ſanis, aut ægrotis alvus nimiùm adſtricta fuerit, ſummitates, & teneriora folia decocta in cibum leguminis loco offerre; alvum ſiquidem citò, efficaciter, & abſq; moleſtiâ, non ſecus ac apices foliorum *Caſſiæ ſolutivæ*, deturbat. Succus verò ſaccharo mixtus Hydropicis ad aquæ excrementitiæ ſaburram elutriandam utiliter propinatur. Soldanellam *Matthiolus* cum *Rhæo* exhibet, *Schroderus* cum *Jingibere*, & ad Scorbutum commendat, quod prodeſſe in pluribus expertus ſum. *Chabræus* tutò pueris, & imbecillibus exhibet, quod alij non admittunt.

140. *Braſſica marina altera.* Hiſpani *in* Luzone *Pie de* Fig. *Cabra*, ob veſtigij pedis capræ figuram, quam folium exprimit, Indi *Lampayong*, *Catancatan*, *Bagaſua*, *Camigang*, *Lagayray*, *Daraypay*, *Ragayray*, *Arogayday*, & *Alagaylay* vocant. Hæc maritima longè, latéq; ſolidis viticulis ſerpendo occupat, & obducit: Nec, ut *Cangcong*, alvo Vires. dejiciendæ deſervit; ſed ambuſtis medendis, & antiquis, ſordidiſq; ulceribus mundificandis, & ſanandis, foliorum pulverem videlicet inſpergendo, & contuſa folia ſub cinere cocta ſuperimponendo. Eadem contuſa, ſale, & oleo mixta, & aſſa Scrophulis impoſita, eas efficaciter diſcutit, ut radix *Zerumbeth*, & folia *Malvæ cordifoliæ fruteſcentis* Luzonis. Succus foliorum illitus prodigioſè capillum creſcere facit. *Folia* craſſiuſcula, uncias tres lata, & totidem longa, parte ſuperiori mucronis loco, ut *Braſſica marina major* C. Bauhin. habet inciſa. *Flores* ſimiles ſunt floribus *Cangcong* quoad figuram & colorem, non ſinguli, ſed plures in longiori pediculo ad folij geniculum exeuntes. *Semen* fuſcum, ſubrotundum, in ovalibus deliteſcit loculis, ſeu vaſculis.

Sect. XI. Scandentes, *uno vaſculo plura habentes ſemina.*

141. *Acetoſa Ternatenſis*, ſeu *Oxypentaphyllum*, Indis Fig. *Sagmit*, *Aguithoay*, & *Tugabang*. Spinoſus, & reptatu Scandens eſt frutex, elegans, & gratioſus; ut rariorem vix conſpexerim plantam. Siquidem *Folijs* luxuriat quadruplicibus, quæ alternatim plura ſimul proveniunt, binis foliolis, ſeu latioribus, & ſeſſilibus unguibus ad exitum comprehenſa. *Folia* reliqua in longioribus, & ſpinoſis

pedunculis, crenata omnia, & aut hederacea trilobata, aut tricuſpidata, vel quinquefolia. Unà cum foliorum manipulo prodit & floris mucronatus petiolus inſidens quinis, quaſi hamatim inciſis, longiuſculis alabaſtris. *Flos* candidus eſt, pentapetalus, palmaris in divaricatione, inodorus, cujus imum internum gratioſa inumbrat purpura, ut floris *Belmuſci*. Seminis hirta, & aculeata receptacula *Semen* claudunt inæquale, ſemine ſinapi majus. Folia *Sagmit*, apices *Alagao*, & cæpacea involucra *Tanglat* Indi piſcibus coquendis adjiciunt.

Fig. 142. *Baligarab Baguin* frutex eſt, cujus virgulta in longa abeuntia ſarmenta volucri modo ſcandunt. *Folia* ſubaſpera Laurinis majora, ex adverſo provenientia, paucis prædita nervis. *Flores* exigui, copioſi, cyanei, hexapetali; petala ſubrotunda, in umbilico ſex candidiſſimorum foliorum, à reliquis diſtinctiſſimorum, & floris formam conſtituentium ſeſſilis congeruntur. Hæc florida, à floribus, & folijs diſtincta-alba folia, dein deciduis floribus, unà cum fructu incrementum ſumunt, & perennant, nec decidunt, ſed ſemper fructibus ſubſtrata eoſdem concomitantur. *Fructus* parvæ ſunt glandes in caliculo denticulato, fauces leviter adurentes. Hic frutex ſcandens, & *Baligarab* arbor quoad formam, uti & nomen cum *ſalice peregrinâ* Leonhardi Rauwolfij, ſeu Maurorum *Garab*, nonnihil affinitatis habere videntur, é quâ ſcilicet fit *Aphronitrum* igniario pulveri parando, uti in *Luzone* ex *Balibago*, & *Bagatbat* arboribus.

143. *Malaſavia*. *Volvulus* eſt ferens *Folia* ſociata, magna, ut *Folium Indum*, &, ut hæc, quinis majoribus fulcita nervis; ad horum genicula binos racemos vaſculorum triquetrorum, ſeu ex tribus latis, papyraceis hemicyclis, & diviſibilibus alis conſtantium, habentium *Semen* compreſſum in latis, & argenteis folliculis. *Radix* capitata eſt, & eſculente.

Fig. 144. *Ariſtolochia Clematilis* Luzonis. *Sarmentis* ſcandendo longiſſimis, altiſſimas quaſq; ſuperat arbores. *Fo-*

lium alternum, ſpithameum, palmo latius, trinis luculentioribus, & alijs quam plurimis dotatum, in mucronem protenſum. *Flos*, & ſeminis pericarpium ſimilia reliquis *Ariſtolochiis*, ſed crebra racemis ad foliorum exitus. *Radix* longè ſerpens, ſeſquiuncialis, corticis craſſi, ſubflavi; ferventis eſt ſaporis. Utuntur radice *Indi* in ventris torminibus, Vires. ad ciendos menſes, partum, & ſecundinas, obſtructionibus, contumacibus flatuum copiâ, nec non in eroſionibus gingivarum: Et *Ubiutihan*, *Malaubi*, *Bitinbitin* & *Timbatimbangan* vocant.

145. *Malanino.* *Volvulus* eſt magnus. *Folia* habet magna, Fig. & é regione poſita, ut arbor *Nino*; Fructus pariter ſimilis eſt fructui arboris *Nino*, ſed compreſſior, creber, ſubflavus, & rubeſcentibus floſculis pentapetalis, ut *Nini*, ex ipſo fructu undiq; procedentibus conſitus.

146. *Volvulus Amygdaloides.* *Folium* habet ſpithameum, Fig. ferè bipalmum latum, alternum, craſſum, & quaſi coriaceum, obſcurè virens. *Fructus* quoad putamen carnoſum *Amygdalo* ſimillimus, uti & putamen lapideum; ſed major, prout & *Nucleus*, qui flaveſcit, & quaſi ex crebris fragmentis compactus eſt, ut nucleus *Cacao*; ſaporis adverſi. Naſcitur *Silanij* ad fluvium.

Sect. XII. Scandentes *folio compoſito*.

147. *Volvulus Pineæ Vermifugæ*, Indis *Niongiogan*, & Fig. *Bavaybavay.* Uno ramuſculo communiter decem habet *Folia*, & hæc ex adverſo poſita, palmum lata, ſeſquipalmum, aut ſpithamam longa, mucronata, & lætè virentia. *Flos* in ramuſculorum provenit ſummitatibus, racematim cohærens; eſt autem ex longo, & tenero tubulo pentapetalus, inodorus, externè candicans, internè ex gratioſâ palleſcens purpurâ. Floribus ſuccedit pentagonus, & pentaſoris *Fructus*, niger, corticoſus, & fructui *Bilimbin* ſimillimus, ſed vix unciâ longior, qui corticoſo putamine rejecto nuculam offert formæ pineæ, ſed ex quinq; hemicyclis carinulatam, ſaporis grati, ceu Cocci teneri, qui lumbricos, & ventris tineas pellit, & interimit. Si in-

cautè, & in copiâ offeratur, ſingultum cauſat, & ſitim. Idem præſtat foliorum *Succus*, qui & oculis inſperſus, nubeculas diſcutit.

Sect. XIII. Scandentes *minùs cognitæ, folio compoſito.*

148. *Lignum Sanctum* in *Luzone* vocant lignoſa, brachialia, ſubruſa, poroſa, ſaporis non ingrati, cortice veſtita, ex ſubſulvo, & phœniceo variegata, & tranſverſim diſſecta, multoties ex interveniente cortice quodammodo effigiem Roſæ exhibentia Sarmenta *Volvuli Maximi*; quem Indus *Camurim*, & *Tagalijs*, meliùs *Tacilis* vocat, Hiſpanus *Palo Santo.* Cortex internè interveniens, & Roſæ folia interſtinguens indicare videtur Sarmentum non tantùm ab intrinſeco, ſed & forinſecè accreſcendo ſumere incrementum, & augmentari. *Folia* gerit communiter ex 14, 16, aut 18 compoſita; folia ſpecialia ex ſubrotundo mucronata, alternè appenſa, in quibus nervuli per ea diſcurrentes quaſi alia depingunt folia. Fluviorum amat ripas: De Flore, aut Fructu nihil ſcire potui. Vires. Sarmenta vulgus Quaiaco utiliter ſubſtituit; ſudores potenter promovere expertus ſum in refrigeratione, & Morbo Gallico: Concoctionem adjuvare de reliquo, & cibi dejectam reſarcire ferunt appetentiam; prægnantibus tamen ſine abortûs periculo exhiberi non poſſe.

Fig. 149. *Camaſga.* Frutex eſt ſcandens, cujus vieta ſarmenta *Indis* liguſtrum præſtant ſepibus colligandis. *Folium*, quod alternè provenit, componitur ex alijs ſeſquiuncialibus, oblongis, mucronatis, exſuccis, ſubalbidis, & ſubhirſutis, ſibi oppoſitis 25 foliolis. [illegible]*lorum* congeſti, & breves ramuli parvos, candidos, inodoros, & pentapetalos ſuſtinent floſculos. Sarmentoſum lignum fruticis *Camaſga* conciſum, & decoctum multi utiliter calidè ad inſtar *Tchia* bibunt, defatigati nempe ab itinere, quos reficit.

Fig. 150. *Volvulus Malarayo.* Magnus eſt; *Sarmenta* craſſitudinis carpi, leviſſima, tranſverſim reciſa varias ſpongioſæ materiæ exhibent figuras. *Cortex* cinereus, aſper. *Folium* Pyri, quinum in uno ramuſculo. Sect.

Sect. XIV. Scandentes *minùs cognitæ, folio alternè exeunte.*

151. *Volvulus Abſynthites*, Indis *Macabuhay*, aut *Macabubuhay*, Fig. id eſt tribuens vitam, alijs *Panavan*, *Palijaucan*, & *Tagnantagnan*. In dumetis, & umbroſis paſſim proveniens, longiſſimis ſcandit *Sarmentis*, digitum craſſis, nodis verrucoſis obſitis, ex phœniceo-luridè virentibus, ſplendicantibus, Viperas quodammodo referentibus, & harum ad inſtar ſenectam deponentibus, ſub quâ Cortex craſſior, carnoſus, & lætè virens, & ſub hoc Medulla conſtans albis, & tenaciſſimis filamentis; ex quorum contextu *Indi* eleganti curioſitate armillas, moniliáq; à venenis, ac peſte, ut ferunt, præſervantia componunt. *Folia* hederacea, ſubrotunda, mucronata, alterna in longiori pediculo, Saporis, ut Sarmenta, Abſynthio magis amari. *Floſculos* mittit in ſeſquipalmaribus ramuſculis, plures, herbaceos, cum apicibus flaventibus, tripetalos, inodoros. *Sarmenta* aere ſuſpenſa, aut plantâ reſciſſa arboribus involuta diutiſſimè virent, & vivunt; imò & folia emittunt: Et, quod admirandum, filamenta filum ligatorium craſſa, rectiſſima, ſeptem ſæpe, aut plures longa Orgyias, terram, ut radicentur, quærentia demittit; ubi radicantur. & ſarmenta jamjam marceſcentia denuo reſtaurant, reficiunt, & refocillant. Vires. Succus, aut decoctum Sarmenti aſſumptum venenis adverſatur, febres, præſertim tertianas, infringit. Lepram, & Morbum Gallicum curare ferunt; & ut reliquiæ tumorum efficaciùs diſſipentur, ocyúſq; exulcerationes ſordidæ, & gummata Gallica mundificando ad cicatricem perducantur, lotiones, fotus, inſeſſus, & balnea vaporis ſudorifera inde parata adhibentur: Radix ſummoperè laudatur ad dejectam cibi appetentiam reſtaurandam, ad diarrhœas item, & vomitus ſiſtendos. Oleum ex ſarmentis, & *Seſamino* inſolatione paratum ad præſentiam Malefici *Barang* efferveſcere narrant. Nonnulli Oleum componunt Polychreſtum ex *Paliyavan*, *Nglaſſon*,

Pangaguaſon, *Manungal*, & *Borogtongon*. Succus ablactandis deſervit pueris. Sarmenta contuſa curant manantia ulcera, & *Ten* id eſt.

152. *Alanguilang Baguin*. *Folium* exerit alternum, aſperum, ſubhirſutum, ſpithameum, palmum unum latum, parte pronâ atrè virens, terſumque. *Flos* inſidens tribus flavis, & convexis alabaſtris, magnus eſt, atro purpureus, inodorus, hexapetalus; folia oblongo-obtuſa. Floris umbilicum flavus, echinatus, ſeſſilis, & moro compar, ex crebris, & oblongis ſeminibus coagmentatus occupat nodus. Frutex eſt ſcandens.

153. *Banag Camagſa*, ſeu *Ronas*, aut *Ubiubihan* vocant Indi hujatem *Pſeudochinam*. Sumitur, & ſubſtituitur pro *China* præmiſſâ decoctione. Reperitur *duplex*; ſubdulcis, rubra, folio peramplo. *Altera* alba, radice amarâ, & folio anguſto, mucronato.

Fig. 154. *Pilipoc*. vel *Piligpoc*. Spinoſa eſt planta, & ſcandens, ut *Lactang*, cujus *Sarmenta* tranſverſaliter ſciſſa ijſdem gaudent circulis, quibus Sarmenta *Lactang*, ſed alba ſunt, ſolidiora, & non flava. Defertur *Leyte*, *Otton*, *Baraguen*, & *Panay*; amat umbroſa, & ſaxoſa. *Folium* dilutè viret, quaſi frontatum, alternum, ſpithamâ brevius. *Radix* majuſcula, longa, lignoſa, candida, amara cum acrimoniâ, odoris petroſelini, non raro tuberoſis excreſcentijs inæqualis. Vires. Venenis omnibus efficaciter reſiſtere tradunt, ſagittarum verò veneno infectarum vulneribus officere; alvum pulveris ʒjß ſine moleſtiâ repurgat, & in affectibus dubiis, & incertis curandis (hujuſmodi multa *Indi* recommendant) ſecurum eſſe medicamen refert Nirembergius. *Philipog quatuor* reperiuntur *ſpecies*; *duæ*, ſcilicet *Mas* & *Fæmina* in petroſis, & *aliæ duæ* in montibus ſylvoſis. *Mares* corticem habent aſperum, magis morellum, & ſine morâ ſcandunt. *Fæminæ* plus repunt, quàm ſcandunt; *corticem* habent terſum, & magis amarum. *Folia* Lauri majora. Montana omnium efficaciſſima, imò & aliarum *Contrayervarum*, id eſt Antidotorum correctiva.

Purgat bilem, & pituitam, ſed ſola tardè, & leniter: quare cum alijs propinatur. Raſura corticis aquâ ſubacta ſcabiem detergit, & exſiccat. Vires.

Sect. XV. Scandentes *minùs cognitæ, folio é regione poſito.*

155. *Mangagao.* Scandens, & arboreſcens eſt planta. *Folio* ex adverſo poſito, longiuſculo, parvo, & terſo. *Cortice* aſpero, craſſo, amaro. Vires habet *Daocar*, & valet ad eadem.

156. *Liguſtrum Molavin.* Volubilis eſt planta, *ſarmentis* pertinaciſſimis, unde á duritie ligni *Molavin* & nomen mutuatur. *Folia* gerit atro-virentia, ſplendentia, neglectiùs crenata, in ſeſſili pediculo, ſibi ex adverſo poſita, ſpithamea, & palmum ûnum lata. Fig.

Sect. XVI. Scandentes, *quorum florem, fructum, folium aut horum ordinem ignoro.*

157. *Pangalamayo.* Planta Scandens; laudatur ad mammas ſuppuratas, & dyſenteriam. Vires.

158. *Hogaban*, vel *Ugaban.* Convolvuli lac clarificat viſum.

159. *Bolongan.* Convolvulus folium habet *Cannacori*, ſed odoriferum: Invenitur mas, & fœmina; hæc cenſetur efficacior, & habet folium atro-virens.

160. *Bucao.* Convolvulus, fructu rubro, *Bahay* ſimili, qui maturus nigreſcit.

161. *Alilitan.* Volvulus, *folium* habet piloſum, laciniatum, mediocre; *Sarmenta*, ut *Camote.* Valet ad tumores diſcutiendos, & pruriginem *Baſal* folium contuſum, calce mixtum impoſitum. Eſt verò *Baſal* Eruca piloſa, tactu pruritum moleſtiſſimum cauſans, & exulcerationes, manantiáq; faciens ulcera. Vires.

162. *Maliſad.* Convolvuli fructus dolorem ſanat ventriculi, & vulneribus telis intoxicatis factis medetur.

Vires. 163. *Taloroog.* Convolvuli *radix* valet contra febres, diarrhœas, dolores, & morſus animalium venenatorum.

164. *Calingag.* Volvulus Alexipharmacus, folio longiuſculo.

165. *Caviran.* Volvulus ad genicula corniculatis aculeis armatus.

Vires. 166. *Hagur.* Planta ſcandens, ſpinoſa, cujus *radix* admirabiliter adverſatur venenis.

167. *Lamparahan*, ſeu *Baguin Famoſo* antonomaſticè.
Vires. Eſt volubilis planta, cujus Sarmenti Scobs, ſuccus, aut decoctum potum, vel in enemate exhibitum Colicam, Choleræ morbi, & omnem ventris, aut ventriculi placat dolorem, & á viperis demorſis ſubvenit. Radix contuſa, & impoſita diſcutit *Pamajas*, *Lamparones*, id eſt Scrophulas, ut folia *Braſſicæ Marinæ*, *Pes Capræ* vocatæ. *Indorum* nonnulli componunt Panaceam, ut volunt, omnia ſanantem ex *Lamparahan*, *Pamuhat*, *Bayagcambin*, *Putat*, & *Mangungal*.

168. *Baguin* antonomaſticè, id eſt volvulus. *Sarmenta*, & virgulta habet vieta, & contumaciſſima, vicem præbentia liguſtri. *Folia* ſociatim ſena, aut etiam plura in uno ramuſculo, ſeſquipalmaria, & majora, trinervia, & ex atro-virente ſplendentia. *Fructus* ſunt poma frequentia, ſphærica, ex viridi flaventia, magnitudinis nucis juglandinæ putamine viridi liberatæ, carnoſa, cum *Seminibus* crebris, compreſſis, nuci vomicæ caninæ vix non ſimilibus, at minoribus, albicantibus, pellucidis, & quaſi corneis, Saporis adverſè amari. An ſpecies *Nucis Vomicæ Officinarum ?* Num idem ac *Lamparahan ?* ignoro.

169. *Duclitan.* Volvuli prægrandis, ut *Tugtungajas* eſt. *Sarmentum* ligni poroſi, cortice mollioris, dilutè rufi,
Vires. corticis craſſi, ſubrufi, aſperi, ſolidi, & inſipidi. Raſura vulnera recentia 24 horarum ſpatio admirabiliter conſolidat, ulcera antiqua detergit, & ſanat. Pota partum accelerat,

lerat, & fœtum expellit mortuum ſine morâ. Alij *Palo del Cap Franco* vocant; affertur ex plagâ *Honda*. Alijs *Palo de los Sambales.*

170. *Malaſauva.* Eſt aliud etiam ſcandentis plantæ lignum, minùs craſſum, æquè ut *Duclitan* vulnera efficaciſſimè ferruminans. An *Tugtungajas Maragondonenſis?* Lignum vulnerarium *Paynan de los Aetas*, nî fallor, idem eſt ac *Duclitan*, forma ſiquidem, ſoliditas, & ſapor eadem cum illo. Diſtinguuntur à *Tugtungajas*, ſolidiora ſiquidem, & ponderoſiora ſunt.

171. *Baclacar.* Eſt *Sarmentum* volvuli, conſolidans, facie radicis liquiritiæ, cortice aſpero, ligno ſolido, flaveſcente, poroſo, ſaporis acerbi. Defertur *Zebuc.*

172. *Malacatmon.* Magnæ, & ſcandentis plantæ *Sarmenta* inciſa aquam ſtillant limpidiſſimam, dejectionibus cruentis, & hepati calidiori ſalutarem. Pariter & conducit inflammationi oculorum, gutturis, & faucium aphthis in collutione, & gargariſmo.

173. *Abongluy.* Planta eſt ſcandendo ſeſe involvens. *Folia* folijs *Pilipoc* anguſtiora. *Cortex* cinereo-fuſcus. *Radix* alba; lignoſa Trunci materies flaveſcit; ſaporis eſt ſtyptici, ſubſalſi, amaricantis, demum mordice morſicantis. Valet ad eadem, ad quæ *Daocagay*, ſeu *Igaſod.*

174. *Panilon.* Planta amplexicaulis, magna, ut *Abongluy.* *Cortex* Sarmenti niger, & glaber. *Lignum* coloris lutei. *Mas*, & *fœmina*, utraq; odorifera, ſed *fœmina* vehementiùs, ita ut dolorem cauſet capitis recenter reciſa; ſaporis adverſi, & fatui. Uſus cum alijs contra venena. Fœminam alij *Paulan* vocant. *Species tertia* ligni albi, minùs odora, & minùs efficax eſt.

175. *Sumpa* antonomaſticè, id eſt *Contrayerva*, ſeu Antidotum. Planta eſt ſcandens, arboreſcens, alexipharmaca, ſeu venenis reſiſtens, purgans. *Cortex* albicat. *Folia* ſimilia juglandinis, læte virentia, terſa. Utuntur cortice, & radice, quæ amara ſunt cum acrimoniâ, & ſtypticitate. Uſus, & doſis *Dalabrab*, ſeu *Tabàs.*

176. *Palacat.* Volubilis, & arboreſcens planta, ligni ſolidi, deforis coloris *Daocagay*, ſed obſcuri magis. *Cortex* rubens, craſſus digiti dimidium, qui maſticatus ſalivam reddit ſanguineam, adſtringens cum aliquâ acrimoniâ. *Folia* inconcinna, ſpithamea, & ad exortum duodecim ſpinulis munita. Alexipharmaca eſt. *Palacat* arborem vide ſuo loco.

177. *Hanboboaya.* Planta eſt ſcandendo arboreſcens, ſimilis *Panilon*, cujus fere coloris eſt lignum Sarmenti, ſed craſſius. *Sarmentum* totum verrucis obſitum, tenax, pertinax, & vietum, ita ut pro anchorarum deſerviat camelis. *Folia* quaſi laurina, minora. *Radix* ſaporis ſubamari, modicè ferventis, cum aliquâ adſtrictione. Additur Antidotis.

178. *Panabol.* Planta ſcandens. *Caudex* ex albo flavet. *Folia* ſunt Aurantij. *Radix* piper ſapit. Eſt unum ex præſtantiſſimis Antidotis; exhibetur communiter *Maguindato* commixtum, & optimos ſortitur effectus. *Panabol* arborem vide ſuô loco.

179. *Caobos.* Planta eſt ſcandens. *Cortex* Sarmenti niger. Lignoſa materies ex albo crocea. *Folia* pulchella, ſpithamâ longiora, ad tactum aſpera. *Radix* ex adſtringente ſaporis adverſi cum aliquâ acredine. Immiſcetur Antidotis.

180. *Mangoncong.* Planta ſcandens. *Cortex* coloris ex rufo nigreſcentis, parvis verrucis tuberoſus. *Lignum* ſolidum, ſubfuſcum, amarum cum aliquâ acrimoniâ. Vires *Pilipog* efficaciores.

181. *Pamgnao.* Planta ſeſe involuendo ſcandens. *Folia* gerit *Olivæ* folijs majora, & magis obtuſa. *Caulis* parvis obductus ſpinulis. *Radix* Saporis boni cum modicâ morſicatione, cujus recentis corticis Scobs tumores reſolvit, & inflammationes tollit. Siccare convenit fumo, non Sole.

Appendix *ad Scandentes, & Volubiles.*

182. *Cayolacka* in Siao, *Lelima* Celebes, *Taratara*, vel *Tadatada*, & *Sandana* Byſaiani, *Kanchinhìo* Sinæ, *Sandalo* Hiſpani vocant Lignum atro-rubens, ſolidum, ponderoſum, gummoſum, inficiens, Santalo Citrino odoratius, aromaticum, primùm ſubdulce, mox amariuſculum, & demum probè maſticatum non nihilum fervens, brachium craſſum, cortice & alburno liberatum, & communiter cavum. Mittitur *Batachina*, *Kauchinchina* ſed palleſcens. *Peta de Sanguil*, *Tahontungan*, *Siao*, *Buraguen*, & *Camarines* ſolidius, & gummoſius. Eſt autem Convolvuli, ſeu *Plantæ Scandentis maximæ*, cujus Sarmenta non raro femur craſſa, cor, ſeu matrix. *Folia* aiunt eſſe Rubi Idæi folijs ſimilia. Suffumigijs, & odoramentis dicatum eſt. An *Aſpalathus* Eryſiſceptrûm?

183. *Tinganpaquis*, ſeu *Saguinſaguin*. Planta eſt *Sarmentis* longè, latéq; repens, & ſcandens ; orbatis folijs, quæ non niſi in apicibus proveniunt. *Fructus* promit per intervalla *Palantanis* ſimiles, minores eis, quos *Obiſpos* vocant, ſaporis grati, ſi maturi ; gaudet paluſtribus.

184. *Pangagbaſun*. Planta arboreſcens, altiſſimè ſcandens. *Cortex* ſubfuſcus cum verrucis, craſſus calami ſcriptorij. Lignoſa radicum, & ſarmentorum materies poroſa, cum matrice ſpongioſâ. Saporis amari, & adſtringentis eſt cortex. Gaudet viribus ijſdem, quibus arbor *Pangagbaſun*. Eadem eſſe videtur, ac *Igaſur*, & *Daocagay*.

185. *Malacapulco*. Planta alijs ſubſterni gaudet creberrimis ſarmentoſis virgultis. *Folia* alterna, compoſita communiter ex 13, palmum longis, ſeſquiunciam latis, ſubrotundis, ex adverſo ſubincanis. Fig.

186. *Niogniogan altera, fructu tetragono.* Volubilis eſt planta, ſarmentis pertinaciſſimis arborum altiſſimas conſcendens. *Folia* trinervia ſociatim exeunt, 6 aut 10 in Fi

uno compoſitorum folio. *Seminis vaſcula* tetragona, altè alata, papyracea, unam includentia nuculam oblongam, ſtriatam, molliuſculam. *Capreoli*, quibus ſeſe ſpiratim innectit, bifurcati ſunt.

Fig. 187. *Volvulus digitalifer.* Longis ſcandendo ſarmentis *folia* exerit alternè, pentaphylla, lætè, & ſplendidè virentia; ad horum ſinus forficulæ longiores, ad extremum fiſſæ, & in varios convolutæ cincinnos. *Vaſcula* ſolidiuſcula, digitum auricularem craſſa, longiora effingentia, digitalia, coloris ocræ, & in ſummo tribus valvulis dehiſcentia, in cubitalibus congeruntur racemis. Florem, & ſemen necdum habere licuit.

Fig. 188. *Planta fruticoſa ſcandens.* *Folium* habet ſubinciſum, alternum, ſeſquipalmare, palmum latum. Ad horum ſinus in longioribus racemulis *fructus* flaventes, exiguos, ſparſim appenſos.

Fig. 189. *Gayduygayduy.* Planta eſt volubilis. *Folium* mittit alternum, lætè virens, crenatum, ferme ſeſquipalmare, ſubrotundum. Seminis papilonacea *vaſcula*, triquetra, coloris palearis, in ramoſis, ſpithameis, & longioribus racemis ubertim conglomerata. *Semen* ſpadiceum, parvum, cordiforme.

Fig. 190. *Colutea ſcandens.* Frutex eſt ramoſiſſimus, longè repens, & ſcandens. *Folia* ex 17, 19, aut 21 Senæ paribus componuntur. *Floſculus* albidus, exiguus, galeatus. *Folliculi* compreſſi, ut Senæ, communiter biventres, deforis lunato orbe notati, ſcilicet ubi *ſemen* deliteſcit, quod majus eſt, quàm Senæ, Phaſeolum referens compreſſum.

Fig. 191. *Ubayban.* Frutex eſt ſcandens, ſimilis fructui *Camagſa*. *Folium* ſeſquiunciale, infernè caneſcit, ſupernè ex atro-virente ſplendicat, obtuſum eſt, & alternè exiens, & 30 circiter in uno ſpithameo, majori, ſeu compoſito folio. *Floſculi* puſilli, aurei, ad foliorum exitus, quibus ſuccedunt *baccæ* ſimiliter aureæ, magnitudine ciceris, ſed compreſſæ, & ſenis carinulis, ut fructus *Banquiling*, ſulcatæ, continentes ſena, nigra, & anguloſa *ſemina.* 192.

192. *Scandentis Plantæ Malacatmon* Folia alternè enaſcuntur, ſolidiuſcula ſunt, & aſpera, palmum lata, ſpithamam longa, rariùs, & majuſculè dentata, & nervis crebris ad marginem uſq; protenſis fulcita, folijs arboris *Catmon* ſimilia, ſed non tam ampla.

193. *Vaynillam*, id eſt Vaginulam, ſiliquam eſſe tradunt plantæ volubilis *Hernandez*, & *Piſo* apud *Raium*. Mihi ſciſcitanti de plantâ *Jac. Antolinus* affirmavit eſſe fructum arboris mediocris. Idem aſſeruit *Emanuel de Leon*, qui pariter *Mexici*, & *Peruvij*, ac *Antolinus*, diu vixerat, addens eſſe fructum arbuſculorum, altitudinis, & ſimilitudinis Geniſtæ, *folia* habere pauca, & longiuſcula, *Vaynillas* plures ſimul congeſtas pendere á caudice, & ramorum majoribus; Odorem eſſe proprium, non adſcititium, ut quidam volunt, & á longinquo percipi odorem arbuſculorum, cùm & ipſa folia eodem prædita ſint odore. Abundat ad portum *Acapulco*. In *Jucatan* vocant *Czijzbik*, id eſt *Capſicum Stupidum*. *Vaynilla* eſt *Lobus oblongus*, *aromaticus* C. Cluſij. Hæc interim, donec *Mexico*, & *Peruvio*, unde pleniorem expetij notitiam, certior fio, aut planta *Acapulco* adferatur, unde expecto. *Vaynillam* recentem *Joſephus Encalada* ait eſſe Lobum teretem, flaveſcentem, ferme cubitalem, & pollicem craſſum, ſi habitior fuerit; qui ad ſolem curatus, ſeu paſſus in ſtriatam, ſeu rugoſam, nigricantem, & odoriferam abit *ſiliquam*.

194. *Planta Scandens Morifera*. *Folia* promit ſubrotunda, ſeſquipalmaria, alterna, ad quorum ſinus continuò ſuper diviſum pedunculum bina quævis rurſum binis ſubſtratis foliolis complexa, ſubrubra mora exeunt. Fig.

195. *Taguina*, alijs *Galamay*, *Calangcang*, *Carangcang*, aut *Cayangcang*. Planta eſt ſcandens, gaudens innaſci, & involvi arboribus emortuis, quandoq; tamen in magnam, & vaſtam aſſurgit arborem. In Marem, & Fœminam diſtinguunt *Indi*, hanc *Calangcang* vocant, & Mare magis odorifera eſt, caudice ex albo virideſcente. *Folia* communiter quina uno cohærent in longiori pediculo, ſed & ſena, ſep-

tena, aut novena nonnunquam connectuntur; ſunt verò ſubluſtria, terſa, nervis carentia, craſſiuſcula, palmaria, & longiora, obtuſa. *Floſculi* puſilli, ex ſubviridi flaventes. *Fructus* ſunt baccæ virides, ſphæricæ, hexagono vertice notatæ, in botro corymboide, quaſi ex crebris umbellis compoſito. Vires Ramuſculo reſecto gutta ſtillat reſinoſa, lactea, odorifera, quæ temporibus illita dolorem lenit capitis. Arbor ſtillat liquorem copioſum, coloris, & conſiſtentiæ ſuccini, ubi induruerit, Hiſpanicæ ceræ ad inſtar impreſſas reddens formas. An ſpecies Terebinthi dicenda? Ex apicibus parantur balnea Morbo Gallico, Lepræ, Scabiei, & dolori capitis proficua.

Fig. 196. *Capparis* Luzonis, Indis *Tagarau*, *Xhabagat*, & *Bagit*, diſtincta eſt á *Cappare rotundifoliâ*, ut & *acutifoliâ* Hiſt. Ludg. prouti & á *Tabagineâ*, ſeu *leguminoſâ*. Longis autem, crebris, ſpinoſis, & circumadnaſcentibus, ſuperinſtratis protenditur virgultis; arboreſcentem caudice bicubitali non vidi, niſi ſemel; de reliquo *Cappari rotundifoliæ* ſimilis, at *folio* longiuſculo, mucronato, biunciam lato, palmam, aut ſeſquipalmam longo, & alterno poſitu enaſcente, é cujus angulo *Cappares*, ſive florum conceptacula, aut petioli ſeriatim ſeptem, vel novem propendent in flores, ſeu roſas parvas, quadrifolias, é candido rubentes, & infinitis fibrarum ſtipatos cirris, unà cum ſtolone explicandis. *Fructus* eſt pomum rotundum, minori Myſniaco æquale, quod maturum bellè rubet, & decuſſatim dehiſcit. *Semen* reniforme, ſubfuſcum, crebrum, Piſo minus. *Radix* cortice tegitur craſſo, albo, & ſolidiuſculo, ut *rotundifoliæ*, Vires. & ejuſdem uſûs. Hujus ſcobem ad vulnera recentia ferruminanda inſperſam *Indi* unicè commendant.

Fig. 197. *Jaſminum vulgare album*. *Baccas* fert rotundo-oblongas, virentes, dein ferrugineè nigreſcentes, morellè tingentes, ut baccæ Myrtillorum, & *ſemen* continentes, gigartos longiuſculos.

Fig. 198. *Jaſminum* Luzonis, ſeu Indorum *Camunin*, *Molavin*, aut *Banati*, ſeu *Buxo-jaſminum*. Arbuſcula eſt ramoſa, folioſiſſima, ſpontanea, & umbras amans, raró craſſitudinis femoris, ligni ſolidiſſimi, flaventis, ut Buxi, aut Euonymi vulgaris, quem alij *Tetragoniam*, & *Fuſarium* vocant, tornatilibus accomodatiſſimi. ***Folia*** atrè virentia, terſa, & ſplendentia, obtuſè mucronata, frontata, uncialia, aut longiora, craſſiuſcula, ex amaro acria, folijs Myrti ſimilia, communiter ſeptem, aut novem, ad ſummam 12, aut 13 in uno compoſitorum, alternè, vel ſociatim appenſa. *Floſculi* ad apices in faſciculis prodeuntes, candidi, odoris Jaſmino ſuavioris, pentapetali,decem crocatis ſtaminibus, & umbilicato ſtylo referti ***Fructus*** ſunt baccæ rotundo-oblongæ,in mucronem deſinentes,virentes,mox rubentes, magnitudinis minoris avellanæ,hirſutis gravidæ arillis. Vires. Radicem venenis efficaciter reſiſtere perhibent. Foliorum, & raſuræ corticis decocto fovent vulnera ſagittis intoxicatis facta, & ictus, & exulcerationes ex ictibus animalium nociferorum ortas.

Fig. 199. *Jaſminum*, Arabum *Sambach*, ſeu *Syringa alba*, Indis *Sampaga*, & *Marol*, in Luzone colitur triplex. *Primum vulgare*, *folio* ex adverſo prodeunte, ad ſummum palmari. *Flore* communiter ter trino in uno faſciculato, ex duplici ordine, & 9, 10, aut 12 folijs compoſito, in caliculo ex novem radijs. Hoc diligenti curâ arboreſcit, & multitudine florum compenſat ſimplicitatem. *Fructum* raró ferre, aut perficere videtur, cum qui ſe eum obſervâſſe aſſerat, præter *Raium*, inveniam neminem ; & in Plantis ultra decennium excultis, caudicis tricubitalis, & uncias quinque craſſis, necdum obſervare potuerim, præter rudimentum inane. Planta *Cortice* obtegitur ad Caudicem cinereo, exalbido, & friabili, necnon acriuſculo ; cæterùm vitioſè luxuriat, & niſi frequenti cohibeatur putatione, ſylveſcit, & in virgulta 4, aut 5 ulnarum viminea, & ſarmentoſa profunditur, non tamen vieta, ut liguſtri vicem præbeant, ſed fragilia, nec ſeſe alijs circumvolventia, ſed longiùs ſerpendo excurrentia, & crebrò radices agentia, niſi pedamentis adligata arboreſcere cogantur. Ut lætiùs, & uberiùs floreſcat in *Decembri* aut *Januario* putare convenit in *Luzone.*

Fig. 200. *Sambach alterum* arboreſcere reſpuit, virgultis gaudet crebris, & tenuioribus, folijs ſimilibus priori; *flore* polypetalo, communiter trino in uno pedunculo, gratioſo, ex pluribus ordinibus, qui folia circiter 24 radiatim in orbem ſpargit, relictis in medio alijs petiolum conſtituentibus, quæ nunquam, aut tandem marceſcentibus prioribus foliolis explicantur.

Fig. 201. *Sambach tertium*, vulgus *Japonenſe* vocat. Luxuriat rarioribus ſarmentis, quæ nunquam ſerpunt, ſed rectè attolluntur, & non, niſi in fictilibus, excoli gaudet. *Folia* communiter trina, ac trina caliculum ambiunt, quæ anguſtiora ſunt duobus prioribus, verùm & quatuor, ſex, aut ſeptem numero cauliculum cingunt, & ſæpe in apicibus frequentiſſima quaſi in Thyrſum conglomerantur. *Flos* polypetalus, centifolius, communiter unicus, pulcher, & rarus; aliâs propullulat & monſtroſus, ita ut millena folia gerat, ſed tunc non explicat æqualiter, verum uno, aut duobus lateribus, vel marceſcentibus floris primi aliquot ordinibus, alter ex eodem caliculo ex confuſâ illâ innumerabilium foliorum congerie medium floris occupante, quaſi poſthumus emergit, propullulat, & aſſurgit. Vires. Radicis *Sambach Orientalis* ſuccum, aut pulverem ad ℥ij exhibitum, partum accelerare tradunt. Alij in balneo vaporoſo commendant. Radix in dolore dentium, aſtmate, lethargo, & paralyſi utiliter maſticatur. In febribus datur Pulvis ad ʒj. Occidentem ſpectantem venenum, & nocivam eſſe volunt. An Arbor, cujus radix Orientem ſpectans antidotum, occidentem ipſum venenum, de quâ *Pineda*, & alij. Folia contuſa ulcera antiqua manantia, & ſerpentia detergunt, cohibent, & dolorem leniunt. Aqua, aut infuſum florum viſum acuit. De Oleo vide *Raium.*

202. *Panuſtus.* Frutex eſt ſcandens, *folio* conjugato, amplo,

plo, villoſo, in ambitu rariùs fimbriato, & ſeptem luculentiùs eminentibus nervis fulcito. *Fructus* quadrangularis, in mucronem abiens, minor avellanâ, pulvere repletus, in racemo prælongi cohæret pediculi. Vires. Decoctum foliorum *Panuſtus* dentes vacillantes confirmat, gingivarum, & maxillarum reſolvit tumores, & fauces exulceratas ſanat.

203. *Camunin alterius*, ſeu montanæ lignum Hiſpani *Palo de Mierda*, id eſt *lignum Stercorarium* ob gravem odorem vocant. Ex fuſco ſubcroceum eſt, ſolidum, & ponderoſum, optimum, & efficax contra contagia, quod ex inſulâ *Capaloa*, *Tayavas* inter, & *Malindic* ſitâ defertur. Scobs allio, & Aſſâ fœtidâ contuſis permixta, & illita ſpaſmo medetur. Differt á priori, quod *folium* gerat minus, *florem* inodorum, *lignum* confrictum, & uſtum odoris gravis, &c.

204. *Taratara.* Fig. In *Camarinorum* vico *Tabaco*, qui inſulam *Catanduan* reſpicit, abundat, ubi ab Indis *Balongcauvit* audit. Scandentis fruticis eſt lignum, *Cortice* tegitur exalbido, maulcoſo, ſcabro, ſub quo liber corticoſus, ſubfuſcus, ſaporis nullius manifeſti. Alburnum poroſum eſt, purpurea matrix inæqualis. *Folia* non ſunt Rubi Idæi, ut mihi retulêre, ſed ſunt folijs ſalicis ampliora, communiter palmaria, aut longiora, ad ſummum bipalmaria, & uncias duas lata, alternè exeuntia, atro-virentia, ſubluſtria, odoris ſylveſtris, quinq; ſeptem, aut novem in uno compoſitorum, quorum ſupremum ſemper majus cæteris, quæ pariter alternatim appenſa ſunt ramulis, punctis albis notatis.

205. *Suaſua.* Similiter ſcandentis fruticis lignum eſt, ſed flavum, & *Taratara* magis odoratum. Hoc ab *Indis*, & *Hiſpanis* in *Luzone* pro Santalo flavo, ut *Taratara* pro rubro, ſed perperam habetur. Aliud ferunt reperiri æquè ſcandentis plantæ odoriferum lignum, & album.

206. *Frutex ſpinoſus ſcandens, fructu pentagono, echinato.* Fig. *Folia* gerit ad virgultorum geniculos, ſimilia folijs *Batele*, plura ſimul, & incerti numeri, & formæ, ac magnitudinis, congeſta; ubi & binis aduncis defenditur aculeis. *Fructûs*

vaſcula in ramoſis, & magnis racemis, uncialia, oblonga pentagona, quinquevalvia, echinata, & neſcio quid viſcoſi glutinis oblita, *nucleum* continentia oblongum, foſſulâ hiantem.

Fig. 207. *Macabuhay aeta.* Frutex eſt ſcandens, *folia* ampla, alterna, tenera, rotunda, in exiguum vergentia mucronem, acetoſa, quinque luculentioribus ſtipata nervis, in ſpithameo pediculo.

208. *Panalongdong*, alijs *Camagſa.* Diſtincta planta á *Camagſa*, ſeu *Ligno Sancto*, ſed planta ſcandens, ut illa, ſarmentoſa virgulta mittit, vieta, *Bexuco* pertinaciora, & magis durabilia, nigerrima, ut Corallium nigrum. *Folia* folijs cannæ ſimilia. *Flores* parvi, rubelli. *Baccæ* rubræ, rotundo-oblongæ. *Radix* multiplex, cortice nigro, odoris, & ſaporis aromatici ſine acrimoniâ, conveſtita.

209. *Talongotong.* Volvulus ſucci rubri, ut *Binonga.* Vires. Utuntur decocto epoto in exituris, affectibus ſcabioſis, & abſceſſibus internis. *Folia* ampla, ut *Mavolo.*

210. *Roſa ſylveſtris ſcandens* Luzonis. *Radix* Plantæ mediocris, cubito longior eſt, craſſitudinis palmaris, cortice tenui, papyraceo, fuſco intecta. *Caro* alba, dulcis, rapo magis compacta.

211. *Pating Prima*, alijs *Salibangbang-baguin. Flos* non eſt penta-ſed tetrapetalus, croceo-rubens, in bicubitalibus alternatim ſpithameis ramuſculis brachiatis racemis, exceptus tetraungui perianthio, & trinis crocatis ſtaminibus, & ſiliquulæ rudimento, ſeu embryone dotatus.

212. *Dilan-butiqui.* Planta ſcandens, diſtincta ab arbore, *radix* ligneo-fibroſa, cinerea, ſaporis acriuſculi ut *Camayſan*, cum aromaticitate. Utuntur eâ *Indi* in Cachexiâ, obſtructionibus, & cacochymiâ.

II. *A Letter from* Mr Anthony Van Leeuwenhoek, *F. R. S. concerning the Barks of Trees.*

Delſt *in* Holland, *March* 27, 1705.

ALtho I have been many years fully convinc'd in my own particular, that the Bark of Trees was produced from the Wood, and not the Wood from the Bark, as many have affirmed ; yet I find that ſome, and thoſe per-ns of good Learning, do maintain the ſame Hypotheſis ; d ſo eſpecially did a certain Gentleman, that was lately at my Houſe. This induced me to make a nicer Enquiry into the Barks of Trees, in order, if it were poſſible, more fully to convince the World than I have yet done, that the Bark of Trees does always proceed from the Wood. I had a piece of Cinnamon Wood, about the bigneſs of a Quill that's uſed for writing, which had its Bark ſtill upon it ; I judged that this piece of Cinnamon Wood would be the moſt proper to prove that the Bark is made out of the Wood, becauſe that the Horizontal Veſſels of that Wood were of the ſame Colour with the Cinnamon itſelf. But as nicely as I dealt with this Wood, I could not cut it into pieces acroſs, ſo as to keep the Bark and the Wood united, but the Bark would always be ſeparated from the Wood, of which I could not underſtand the meaning, till I call'd to mind that the Iſland of *Ceylon* is ſituated between the 5th and 10th Deg. of Northern Latitude ; ſo that the Fruits, Wood and Bark are of a continued whole years Growth, whereby new Saps and Juices are always carried up between the Wood and the Bark, in order to make the new Wood and the new Bark. For this is the reaſon that the Bark of Cinnamon is ſo eaſily ſeparated from the Wood.——Wherefore, not finding my account in this Experiment, I turn'd my thoughts upon the Bark of Cherry, Plumb, Beach-tree, *&c.* the Veſſels of which Barks are not extended lengthways, but circularly about the Wood; and in order to demonſtrate the ſame, I cut off this ſmall Twig of a Cherry-tree.

Fig. 1. ABCDE repreſents a thin Twig of a Cherry-tree, in the Wood of which the Canals or Veſſels of the Bark, by which the ſame is fed, are not extended lengthways, but circularly about the Wood; for which reaſon the Bark of the ſaid Wood can't be ſtripp'd off longways, but only circularly, contrary to ſome other Woods, as in the aforeſaid Figure; where by CFDG, a ſmall piece of the ſame Bark, as it is ſtripp'd off, is repreſented; in which you may obſerve, that the Canals or Veſſels, of which it is compos'd, run from C to F, or from D to G.

I have aſſerted formerly, that in all Countries where there is any Winter, ſo far as to put a ſtop to the Growth of Trees, at all times as long as the Growth endures the Bark grows thicker, and that the New Bark does protrude that which was made before further and further from the Wood; inſomuch that in the Barks of Old Trees, one may cut a Fingers Breadth in Depth before one can come at any thing like Greenneſs or Sap: And if one conſider thoſe Barks with care, one ſhall diſcover what part of the Bark from time to time is deprived of its Nouriſhment, and conſequently what part of it is quite dead.

By theſe my laſt Obſervations, I have diſcovered in a Twig of a Cherry-tree of one years Growth, that the Bark does conſiſt of at leaſt ſix thin Membranes, whoſe exceeding thin Veſſels or Fibres extended themſelves circularly about the Wood, and thoſe Membranes were very cloſely united to one another.

I placed one of theſe Membranes, that was as nicely ſeparated from the reſt, as it was poſſible for me to do, before a Microſcope, and cauſed the Painter to draw it as it appear'd to him, as you may ſee in Fig. 2. H I K L, where you may obſerve the Veſſels or Canals do not run longways, but circularly about the Wood; which being ſo, the ſaid Veſſels can't remain long whole, but muſt from time to time be broken in pieces.

When I cut croſs the Wood of a Cherry Tree, which was about a year old, in order to ſhew the Painter the Horizontal Veſſels that are derived from the Wood to the Bark, and whereby the Bark receives its Growth and Nouriſhment, the Bark, by reaſon of the Softneſs and Flexibility of thoſe parts that lay next the Wood, did always yield ſo much, that it was impoſſible for me to ſhew him the ſaid Veſſels.

Upon this I turn'd my Thoughts upon the Beach-wood, becauſe the greateſt part of that Wood is cloathed with a Red Bark, which ſticks cloſe to the Wood, and grows yearly thicker; and upon the outſide of that Bark there is produc'd a Whitiſh ſort of Bark ſeveral times in a year, which falls off from the Wood as if 'twas pill'd; but this only happens in Beach Wood of an ordinary thickneſs; for in the thickeſt Wood this Peeling or Scaly ſort of Bark is not produc'd, and then the Bark grows exceeding thick; but the moſt part of ſuch Bark is thruſt away, and remains as it were without Nouriſhment; and in ſuch there is no outermoſt Scaly ſort of Bark produced.

I ſteep'd this laſt mention'd Wood in Water, becauſe it was very dry, that I might the better cut it through with a ſharp Knife, whereby the Aſcending and Horizontal Veſſels or Canals might receive the leaſt damage in cutting.

Fig. 3. L M N O P Q R repreſents a ſmall particle of the laſt mentioned Wood, as it were cut acroſs, in which the Aſcending Veſſels or Canals, both great and ſmall, are eaſily ſeen, and between which run the Horizontal Veſſels, which receive their Juices from the Aſcending ones.

After ſeveral cuts made with a ſharp Knife, I found the Bark of the Wood to be exceeding hard; and this was moſtly occaſion'd, as I imagin'd to my ſelf, by a Coagulated Whitiſh Matter, which one would take to be Roſin; the hardneſs of which hindred me from cutting the Wood and the Bark ſo eaſily together, as not to hurt the Horizontal Veſſels which were continued from the Wood into the Bark in a Right Line; for the Bark being much harder than the Wood, always yielded to my Knife.

Wherefore I cut off as well as I could a ſmall piece of Wood and Bark at one cut, and placed the ſaid piece before a Microſcope, that the Painter might view the Wood and Bark together.

In the ſaid Fig. 3. by QUTSR is repreſented a Particle of the abovementioned Bark, in which the Horizontal Veſſels, as they lye in the Wood, and are continu'd on to the Bark, and from whence the Bark is produced, are ſhown by NMOP, of which N and O do not go quite throughout into the Bark, by reaſon of that hard Matter which we mention'd before, and which you may ſee in X.

But the Horizontal Veſſels, that are deſcribed by MRS, and PQUT, go throughout the Wood into the Bark, ſo far as to preſerve the Bark from any Mortification.

Now as the Bark of the Beach Tree, or rather its Veſſels or Canals, run circularly about the Wood, I could not at firſt conceive how thoſe Canals could be produc'd out of the Horizontal Veſſels; but at laſt I diſcover'd that as the Horizontal Veſſels are continued from the Wood into the Bark, ſo there ſpouted out from every ſide of theſe Veſſels exceeding ſmall Canals, which run circularly about the Wood, and ſo for the moſt part produced the Bark of that Wood.

In the ſaid Fig. 3. I have repreſented by PQUT one of thoſe Horizontal Veſſels, as they are continued from the Wood, and carried on into part of the Bark, which is deſcribed by QUT, and between Q and U I ſhew a few of thoſe Veſſels which ſprout out of the ſaid Horizontal ones, and run circularly about the Bark; and how nicely ſoever I obſerved them, I could not diſcover one Aſcending Canal, which muſt needs run lengthways up the Bark, in caſe the ſaid Bark had its Riſe from the Root of the Tree.

I placed alſo a thin Scaly Particle of the Bark of the ſaid Wood before a Microſcope, which I cauſed likewiſe to be drawn as in Fig. A 4. A B C D, the Veſſels or Canals of which run alſo horizontally from A to B, or from C to D.

But you muſt not imagin that this and the preceding ſmall Particle of Bark is ſo open as is here repreſented, but conclude, that the Veſſels which run circularly about the Wood are only deſcrib'd, and that theſe Veſſels at firſt lay cloſe to each other, but as the Wood grew greater, they were ſeparated more and more from one another.

Fig. B 4. W X Y Z. ſhews alſo a little Scale of the Bark of the Twig of a Tree, in which the Veſſels deſcrib'd by W X or Z Y do alſo run circularly about the Wood, but I have forgot to what Tree it belong'd, it having been ſome time drawn before I took any notice of it.

After theſe Obſervations, I remembred that I had lying by me a piece of the Bark of a Cinnamon Tree, which was given me by an Officer that had been a Priſoner at *Candi* in the Iſland of *Ceylon*.

This piece of Cinnamon Bark was near 8 inches long, a ſmall part of which is repreſented by Fig. 5. E F G H.

I judged by the diviſion, which I obſerv'd between I and G, and which was the thickneſs of the Bark, that the Cinnamon Tree to which this belonged, was very near 12 years old, and according to the ſame remarks, that the Tree was about 6 inches diameter.

I have ſeveral times examined the outſide of this Bark, and always found it was ſo weak or brittle as if it were partly corrupted or periſhed,and when I cracked thoſe brittle Particles between my Teeth, I could perceive no taſte of Cinnamon in them, ſo that I was forced to pare away two third parts of the outſide of the Bark before I could come to the ſtrong and true Taſte of the Cinnamon.

I have moreover enquir'd into that part of the Bark that lyes next, and is as it were join'd to the Wood, and in cutting it to pieces have ſatisfy'd my ſelf more than before, that the Cinnamon, otherwiſe call'd the Bark, receives both its Nouriſhment and Increaſe alone from the Wood, and not from the Root; for when I divided this Bark into ſmall parts, I could diſcover no Aſcending Veſſels in it; but on the contrary, [ſo many Horizontal Veſſels coming out of the Wood, and thoſe too ſo large, that I don't know that ever I have diſcover'd ſo many Veſſels in the Barks of any other Trees.

Fig. 6. L M N O P Q R S, repreſents a very ſmall Particle of the Bark of a Cinnamon Tree, in which the Horizontal Veſſels lye by one another in ſuch Order, as is here repreſented between L M N R S, or between N O Q R, in which they are all cut acroſs.

Many of theſe Horizontal Veſſels are ſtopp'd or fill'd with an inclos'd reddiſh Matter, which in ſome Veſſels is not ſo high colour'd as in others, ſome of them being almoſt yellow.

You may obſerve the Painter has repreſented theſe Horizontal Veſſels in a manner Hexangular, as they indeed appear'd to him, which is alſo the moſt perfect Figure that Nature could beſtow on 'em, in order to prevent any *Interſtitia*, or Vacuities among them.

We alſo ſee that about the ſaid Horizontal Veſſels there lye longiſh Parts, that run into a Point at both ends, which Parts deſcribed by L M N lye together, and ſome of them are bigger than the others; we may obſerve alſo how the ſaid Parts do ſurroundthe Horizontal Veſſels.

We ſee moreover, that the aforeſaid Parts have often contained in 'em a Matter of different colours, which colours are wholly ſeparated from each other, and appear as in N R S, and where no colours are to be perceived in the ſaid Figures, there they are Tranſparent.

Theſe long Tranſparent Parts, as alſo thoſe that are colour'd, together with the Horizontal Veſſels, which are almoſt all of 'em filled with a colour'd Matter, are in my Opinion the ſole Ingredients of the abovementioned Bark or Cinnamon.

In the ſaid Fig. 6. O P Q repreſent but a part of the Horizontal Veſſels, that lye by one another.

All the ſaid long Particles, which in a great meaſure compoſe the Cinnamon Bark, are not incurvated, as in Fig. 6. but a great many of 'em are extended in Right Lines, as you may ſee in Fig. 7. A B C D E F G, which repreſents a very ſmall Particle of the abovemention'd long Parts, which likewiſe incloſes ſome Horizontal Veſſels; and wherein you may ſee at A how regularly the ſharp Points are ranged by one another, as alſo between B F and C E, between which the Horizontal Veſſels are to be ſeen in that order in which they always lye.

That ſharp and pointed Particle that is repreſented by F H, ſeems to be out of its place; and I fancied that in dividing it from the other Parts, I might have broke it off at F.

I alſo placed 3 other long ſharp pointed Particles before a Microſcope, as in Fig. 8. I K L M, in which you may alſo ſee in how regular an order the pointed parts appear, as in K M for inſtance; from whence we may conclude, that all the other parts of the like Nature are diſpoſed in the ſame manner.

I moreover cauſed the Painter to draw another Pointed Particle, that was exceedingly incurvated; which, I ſuppoſe, might be occaſion'd by its having ſurrounded two ſeveral Diviſions of the Horizontal Veſſels. See Fig. 9. N O P.

We may pretty eaſily conceive how one Canal is produced (or comes out) from another, but how the ſaid long ſharp pointed Particles, repreſented by Fig. 6, 7, 8 and 9 are produced, is, as well as a great many other *Phænomena*, paſt my Underſtanding.

I have moreover examin'd into the Nature of the Bark of a thick Lime Tree, the rather becauſe I know no other Barks of Trees whoſe parts are ſo eaſily ſeparated from one another, either in length or breadth; inſomuch that they make thereof in *Muſcovy* Mats for Packing, and Rope-work, which is very ſtrong, and if I am rightly informed, is not eaſily ſubject to rot, tho it ſhould lye long wet.

This Bark I alſo cut acroſs, in order to diſcover the Bent or Run of the Horizontal Veſſels that come out of the Wood.

Fig. 10. A B C D E F G H I repreſents a ſmall Particle of the Bark of a Lime Tree, as it was cut acroſs; where, by A B C are ſhown the Horizontal Veſſels that come out of the Wood, and conſequently theſe Veſſels are cut length-ways.

Theſe Veſſels, altho at their firſt coming out of the Wood they lye cloſe to one another, as from A to B, and from B to C, yet they don't remain always ſo cloſe, but as the Tree grows thicker and bigger, the Horizontal Veſſels are more divided from one another; as for inſtance, that which at B is but one Bundle or Collection of Veſſels, with the Increaſe of the Tree divides itſelf into two, and the Separation grows larger and larger, as in B M K and B M L.

Now, that there may remain no Interſtice or Vacuity between the ſaid Horizontal Veſſels, there are other Veſſels produced from thoſe, as you may ſee between M I D, which new Veſſels produce a Matter that fills the Place of M L K.

Theſe Parts are Roundiſh, but ſo interlinkt with one another, that they ſerve for Canals; they appear'd ſo ſmall to the Painter, that if he had not drawn 'em bigger than they were, you could not have made any Judgment of them.

Theſe Horizontal Veſſels don't run through the thickneſs of the old Bark, for in ſome places the Bark dies ſooner than in others for want of Nouriſhment, inſomuch that you may perceive in the Bark of a Lime-Tree of an ordinary thickneſs, three diſtinct Cruſts lying one upon another ; the outermoſt of which being deſtitute of Nouriſhment, by little and little become dry and wither'd.

I ſhall never ſuffer my ſelf to be perſwaded that the great number of deſcending Veſſels which are diſcovered in the Bark of a Lime Tree can proceed from the Root of the ſaid Tree, but depend on the horizontal Veſſels of the ſame, which by reaſon of their exceeding ſmallneſs are hardly viſible in Fig 10. For if the Nouriſhment of the Bark does proceed out of the Root, the Bark would never periſh unleſs the Tree did alſo, whereas we ſee that in ſome Trees the greateſt part of the Bark is dead or wither'd.

I took a ſmall ſlice of the ſaid Bark and cut it acroſs, and placed it before a larger Microſcope, and cauſed the Painter to draw it as well as he could, who affirmed to me 'twas impoſſible for him to deſcribe all the ſmall Holes or Orifices which he ſaw.

Fig. 11. N O P Q R S repreſents a very ſmall *Particle* of the Bark of a Lime-Tree, wherein are ſhown partly the mouths of the Canals that lye lengthways in the Bark, and are here cut acroſs, but chiefly to give you a view of the horizontal Canals, as they are cut in their length, as at N S or P Q ; the which horizontal Veſſels are repreſented in Fig. 10. by A I H, B M L G, B M K F and C D E.

Theſe Canals, or Veſſels, deſcribed by N S or P Q are not of a continued Hollowneſs throughout, but rather ſeem to conſiſt of Oval Particles linkt to one another.

I have been thinking with my ſelf whether each of the aforeſaid Oval Particles were not provided with a Valve, which Valves make them appear like ſo many Oval Figures; and the uſe of which Valves might be to hinder the Juices or Saps, which by the force of the Sun are raiſed up into thoſe parts, falling down or deſcending, after the Sun ſet; eſpecially if we conſider, that by the ſaid Canals there muſt be cauſed ſo ſtrong a Protruſion, in Spring time, as not only to thruſt away and ſeparate the Bark from the Wood, but alſo to burſt the outermoſt parts of the Bark, that are already hard, dry and wither'd.

I have ſaid before, that the Horizontal Veſſels or Canals in Cinnamon are Hexangular, which Figure is the moſt perfect, and takes up the leaſt room or ſpace; from whence I conclude likewiſe that the Horizontal Veſſels in Fig. 11. are likewiſe Hexangular, tho I did not ſee them lying in the ſame order; for when I examin'd into the Horizontal Veſſels or Canals of the Cinnamon, I found that they were of the ſame Configuration as in Fig. 11. NS and PQ, *viz.* that they conſiſted of Oval Figures.

I had placed before a Microſcope a little bit of a Lime-Tree, which was cut off of the Wood lengthways, and the Horizontal Veſſels cut acroſs, to the end that you may ſee how thoſe Horizontal Veſſels or Canals lye in the Wood; the which Veſſels are alſo continued into the Bark, ſo far as it is alive, and ſerve for the feeding and increaſing of the ſame.

Fig. 12. ABCDEFG repreſents a little ſlice of the Lime-Tree Wood, in which you may count in 9 ſeveral places the Horizontal Veſſels or Canals that are cut acroſs, and which Canals are ſituated between the ſmall aſcending Veſſels, which for the moſt part do nouriſh the Wood. Now between the Horizontal Veſſels and Canals in the Wood and in the Bark there is no difference, but in the Aſcending Veſſels and the Bark there is a difference; for

they are of ſuch a Diſpoſition as the Horizontal Veſſels which are in the Wood and the Bark; and thus they agree with thoſe Veſſels deſcribed in Fig. 11. by NS or PQ.

Now if we find that the Horizontal Veſſels or Canals, as well in the Wood as in the Bark, are of one Contexture, and that the Aſcending Veſſels in the Bark of a Lime-Tree are alſo of the ſame, we may more firmly conclude, that the Bark is produced from the Wood, and not from the Root.

I have moreover turned my thoughts again upon the conſideration of Cork, which is ſaid to grow as the Bark of a Tree upon a certain ſort of Oak in *Spain*; which if it be ſo, I imagine that the Burning which we perceive in the Leaves of Cork, is done by 2 hot Iron Plates, in order to make it flat and ſtrait.

I took then one of thoſe pieces of Cork which are cut into Stoppers for Bottles, as is deſcribed by Fig. 13. ABCDEF.

In this piece you muſt ſuppoſe that BG is the part that lay next the Tree, and that E was the outſide of the ſame.

In the ſaid piece of Cork, between GHIKE, I obſerv'd five diſtinct Diviſions, running acroſs from F to D, which is the part that ſurrounded the Tree; and from whence I conclude, that the Cork was arrived to ſuch a thickneſs in 5 years time, for each Streak denotes the growth of that year.

I obſerv'd alſo 4 diſtinct dark ſtrokes, of which GI is the middlemoſt; I ſuppoſed they were great Canals, but could not conceive to what end they were made; but I concluded from thence, that in caſe theſe great Canals had not been ſo cut through lengthways, the Cork would not have been ſo thick.

We muſt likewiſe conclude, that the length of all Corks (in order to prevent either Moiſture or Air from paſſing thro them) muſt be conſonant to the length of the Cork as it grows upon the Tree, and ſo that part of the Cork repreſented by A B C was the lowermoſt part, and D E F G was the uppermoſt or near the uppermoſt, according to its ſituation upon the Tree.

Now for my own and others ſatisfaction, I cut a little piece of a Cork as from G, where you may ſuppoſe that it was joyn'd to the Tree, that is to ſay, I cut it after ſuch a manner, that the cut of the Knife went from G to H; and having placed the ſaid piece before a Microſcope, I perceived all the Canals ſo placed as if they come out of the Wood, without diſcovering in the leaſt any aſcending Veſſels, tho I cut it never ſo often; from whence I muſt conclude again, that the growth of the Cork proceeded from the Wood.

Now to give you a better Idea hereof, I have cauſed the Painter to draw a ſmall Particle of the Cork.

Fig. 14. L M N a O P Q b, ſhews a ſmall Particle of a Cork, as it was cut off between G and H, of which L M N we muſt ſuppoſe to be the part next the Tree, and ſo the Veſſels or Canals, by which it receives its Increaſe, run horizontally, as from L to Q, from M to P, and from N to O; but I could not find one ſingle Canal that was perpendicular, or can be ſaid to proceed from the Root.

Theſe forementioned Canals have no thorough paſſage, and it ſeems to me that in each Canal there are ſo many Valves as there are Horizontal Veſſels in them.

In the ſaid Figure by a b, is repreſented a Line running quite acroſs and ſomething incurvated, the which Line is that part of the Cork, where, the Seaſon of the year being over, a ſtop was put to the growth thereof.

For further ſatisfaction, I cut another piece of a Cork after the ſame manner that whereas in the foregoing Figure, the Horizontal Canals were deſcribed in the length, now the ſame Canals were cut acroſs.

Fig. 15. R S T V repreſents a little piece of Cork, as it appeared thro a Microſcope that was more magnifying than the former in Fig 14. this piece of Cork was cut off from Fig. 13. between B and G, and was that part that was next, or that was united to the Tree, and from whence it receiv'd its Increaſe, and conſequently then were thoſe Canals which in Fig. 14. were cut long ways, but now acroſs.

In the ſaid Fig. 15. you may perceive that almoſt all thoſe parts that were cut acroſs did not conſiſt of round Canals, but of hexangular ones, which is agreeable to the moſt perfect order, becauſe it prevents all the vacuities between them ; and I imagin to my ſelf, that in caſe one could procure a piece of Cork, before it had been made ſtrait and flat, after the abovementioned manner, we ſhould ſee the Canals ſo cut acroſs, as in Fig. 15, between R S T U, much more perfectly than we now do. Whereas by the bending it to make it ſtrait, a great many Canals are diſplaced and diſordered ; as in the cutting of it with a Knife the exceeding fine Membranes, of which the Canals are compos'd, are often torn and broke to pieces.

This is what I have thought fit to trouble you with about Cork, but if I were Maſter of that Wood which produces it, I ſhould receive greater ſatisfaction ; whereas I cannot now conceive how the vaſt number of Horizontal Veſſels which are ſeen in the Cork, and of which the whole Cork conſiſts, can be produced by the Wood thereof.

III. *Part*

III. *Part of a Letter from Mr* Anthony Van Leeuwenhoek, *F. R. S. to* John Chamberlayne, *Eſq*; *F. R. S. concerning the Vitrifyed Salts of Calcin'd Hay.*

Delft, March 3. 1705.

I Have receiv'd your Letter, wherein you relate that a great Hay-rick upon *Saliſbury Plain*, after ſome Reaking and Fermentation took fire, and was wholly conſum'd; but that whereas the Aſhes commonly lye looſe and ſcatter'd abroad, they were Condens'd into a firm, but very light ſubſtance, and that there were ſeveral Cart-loads of it; whereof you carried a piece to the Royal Society, who judged that the ſame was Vitrified and Calcin'd together by a particular Heat. When I had viewed a piece of the ſaid ſubſtance, which you were pleas'd to tranſmit to me, my Opinion was the ſame as the Royal Society's, and I hope they will not take it amiſs if I add my Thoughts and Obſervations thereupon: I imagine then that this Vitrified Matter was moſtly fixt Salt, which being render'd Fluid by the great Heat, the Vapours or Moiſture that riſe from the Bottom of the Hay, or from the Particles thereof, which were not as yet Vitrified, had inſinuated themſelves into the Fluid Matter, and that upon the diminution of the Heat the ſaid Vapours being Congealed and Impriſon'd in the Vitrify'd Matter, was the cauſe of its Lightneſs; as we find by Experience, that a very ſmall Particle of Moiſture, being rarified by Heat, fills a much greater ſpace than it did before. For my farther ſatisfaction, whether it was not moſtly fixt Salt, I have made two Experiments, by putting about the bigneſs of a Pea of this Matter on a piece of Charcoal, upon which I blew the Flame of a thick Candle, till the ſaid Vitrified Subſtance began to melt, and then I let it drop into a ſmall Copper Veſſel, wherein there was about half a Thimble-full of clean Rain Water. This ſtuff coming into the Water, with a little ſtirring diſſolved like Powder or Brick Duſt. Whereupon I thought that a great many Salt Particles would Incorporate themſelves with the Water. After the Water had ſtood ſome minutes, I skimm'd off ſome of the top of the Water, and placed it on eight or ten ſeveral very clear Glaſſes, and not above a drop of Water upon each of them; and I ſaw, when the Water was very near waſted, a great many Salt Particles remaining, of very various figures; among which there were ſeveral whoſe Superficies was an exact Square, a few others were Triangular, and others again were Hexangular and Long, which, in proportion to their exceeding ſmallneſs, were very thick; ſo that they look'd like little pieces of Cryſtal, as they appeared to us with the naked Eye, which was no unpleaſant ſpectacle. I ſaw moreover long Particles, but very few, which reſembled the ſmall Particles of Salt Petre. I ſaw alſo ſeveral Particles which were broad in the middle and narrow at both ends; but I did not always ſee of this laſt ſort, which were ſo thin, that they appeared like ſhadows to my Eyes. Beſides the abovementioned Salt Particles, there were an unſpeakable great number of others, which were ſo ſmall, that I could not diſcover their figure; but thoſe that were a little bigger than the reſt had ſome ſort of figures: From whence I concluded, that the remainder alſo were Salt Particles, beſides, where we ſaw one of theſe *Great Salts lying, [**Underſtand by the Great Salt Particles that we mean only ſuch a magnitude as amounts to the Thouſandth part of* *a courſe grain of Sand.*] we could perceive no others round about them for the ſpace of a hairs breadth; and as we could alſo diſcover about the ſaid Salt Particles divers Circles, which we judged to be Coagulated Salts, and which by ſuch an accreſcence grew ſtill greater and greater, we were confirmed in our belief, that the ſmall Particles were alſo moſtly Salts. I told you before that I had put the abovementioned vitrify'd Matter into ſuch a glowing heat, that it was ready to melt; ſince that I took a ſmall Particle of the ſame and put it into a ſtrong Fire, which being melted, began to change it ſelf into a globular figure, whereupon ſeveral Air-Bubbles appeared after one another, forcing themſelves a paſſage, which ſhut up again after they were broken out; and this I continued ſo long till that little Matter became perfectly globular. After this I ſpoke with a Gentleman, who lives a little way out of our City, whom I asked, If ever he had heard of a Hay-rick that had taken fire? Who named me the place, being about an hours diſtance from the Town, and promiſed to ſend the Man to me whoſe Hay-rick it was, or elſe his Neighbour, which he did accordingly.

I ask'd the Man what remained on the Ground where this Hay-rick had ſtood; who anſwered me, a light glazy Stuff and very brittle, which when we walked over it, crack'd and broke under our Feet, and when we put a bit of it in our Mouths, we could perceive the Saltneſs in it.

This was a great Hay-rick, which they reckoned contained more than 100 Load, and each Load was reckoned to weigh one thouſand weight. This Countryman told me that there is great danger of ſuch Hay-ricks taking Fire, if it be put up before the Hay be dry, and there is no remedy for it, but to ſpread it abroad again over the Ground. He gave me an inſtance of one that did not take Fire ſo as to break out into a flame, but ſmoaked very much, and which being pulled down, when they came to about the middle of it, they found ſome of the Hay to be burnt, ſome part clear Aſhes, and a Globe of Vitrified Matter; but he added, that the Fire was quenched, as he ſuppoſed, for want of Air.

IV. *An Account of Inſects in the Barks of decaying Elms and Aſhes. In a Letter from Sir* Matthew Dudley, *Knight*, *F. R. S.*

Clapton in *Northamptonſhire*, *October*, 15. 1704.

About 5 or 6 years ſince, I removed divers Elms, more than ſix inches Diameter, which for the firſt two or three years all thrived very well; but two or three years ago there happening a very dry time in *July* or *Auguſt*, I obſerved one of thoſe Elms, which ſtood very ſhallow, and on pretty high ground, looked very ſick; the Leaves turned yellow, and began to fall off; which made me with a Knife examine the Bark. I found the inſide thereof not ſo green, but of a more reddiſh colour than the others; and between it and the Tree not ſo moiſt, and the Bark ſticking very cloſe to the Wood: But what was moſt remarkable, I diſcerned a great many little black Flyes of the Beetle kind (*viz.* having a hard Caſe, under which their thin long Wings were contracted, and therewith covered) between the Bark and the Tree: And looking more carefully, I obſerved theſe Flyes had made their way thither by piercing the Bark in innumerable places, eaſily diſcernable on the outſide, and was about the bigneſs of a large Pin hole, or rather ſuch as a large Pins head would go into; ſome I found juſt entring, who had not got quite through the Bark, others had made ſome progreſs between the Tree and the Bark, which appeared as a Channel. I deſpaired of recovering the Tree; however, my Servants being Watering others, I cauſed them to beſtow about two Hogſheads on this Tree, with ſtirring the Earth about the Roots, and laying ſome half rotten Litter thereon, to defend it from the ſcorching Rays of the Sun: Upon this the Tree in ſome manner recovered its Verdure again that year, and the next year made very good Shoots, and ſo continued until this year.

But this being a very dry Summer, I diſcern'd divers of my Trees in the beginning of *Auguſt* to look ſick, and particularly the Tree formerly mentioned; I made the ſame tryal on them all, and found the Bark ſticking cloſe to the Tree, with but little moiſture between, and vaſt numbers of thoſe little Flyes, who had pierced the Bark in multitudes of places. I ordered the Earth about the Roots to be looſened as formerly, and about two Hogſheads of Water to be poured on each, and viewing them the next morning, I found the outſide of the Tree almoſt covered with Bees and Waſps, and great black Flyes, ſuch as they uſually call Fleſh-flyes; who were all buſie in ſucking the Juice or Sap, which plentifully run out at every hole, that the little Flyes formerly mentioned had made in the Bark, and which was very Glutinous, and ſweet as Honey. I again examined the Bark, and found it very moiſt between it and the Wood, and all thoſe little Flyes either gone, or drown'd in their new habitation, by the ſudden riſe of the Sap; this Tree recovered.

Upon Examination of ſeveral Trees, which looked ſicker than the reſt, I found almoſt all greenneſs had left the Bark, and there remained no moiſture between it and the Wood; but the Bark ſtuck ſo cloſe to the Wood it was hardly to be parted: And throughout the whole

Tree the Bark was pierced by the aforementioned little Flyes, who from the hole at which they entred, had made each of them a ſtrait perpendicular Channel from their entrance upwards, about two inches long, or ſomething more, very little, if at all, bigger than juſt to move themſelves ſtrait forwards in; for I obſerved they all of them, if diſturbed, came out backwards. All along on each ſide this Channel, as cloſe the one to the other as they well could, ſo as yet to be diſtinct, there were ſmall Channels running Horizontally from it, in every one of which at the extremity thereof there was a Maggot, in ſize juſt the bigneſs of the ſmall Channel, very lively, whitiſh, and almoſt tranſparent. Theſe Trees, tho well Watered, received no benefit thereby, but dyed.

It is to be obſerved, that in thoſe Trees whoſe Leaves looked Green and Healthful, there was none of theſe Flyes to be found.

The Reaſon of which I preſume to be, that whilſt there was a ſufficient Moiſture in the Earth about the Roots, to ſupply the Tree with a due quantity of Sap, ſo thin and diluted that it was proper, and capable of being conveyed into the ſmalleſt Twigs and Leaf-veſſels, the Leaves kept their Verdure, and the Tree flouriſhed: But when, by reaſon of the dry ſeaſon, that ſupply failed, and the Sun perpetually exhaling the thinneſt and more watry parts thereof through the Bark, the Sap already in the Tree became inſufficient in quantity, as well as improper, by reaſon of its thickneſs, to ſupply or enter into all thoſe ſmall Veſſels. The Leaves loſt their Greenneſs, and fell off, and the Sap became thick and very ſweet, (which I have found it is not when it is duly diluted, and the Tree in good health;) this invited thoſe Flyes to make their way to it, as a proper Nurſery to bring up their young ones; which I take thoſe little Maggots to be. I preſume alſo, that the Eggs were firſt laid in the

great

great Channel, (and, it may be, regularly placed at their due diſtances, in the ſides thereof) and after being hatched, made thoſe ſmall Channels themſelves; ſince thoſe ſmall Channels are no way capable of receiving the Old Fly, and that the Maggot is always found at the farther end of the little Channel, and the reſt of the little Channel is perfectly filled with very ſmall Particles, which, when dry, became fine Duſt; and I conceive to be either the Excrements of the Worm, or parts of the Bark ground ſmall by the Teeth of the Worm, to make its way forwards, and rejected as not proper Aliment, or both.

About the middle of *October* I found thoſe little white Maggots, and conſequently their Channels, which they exactly filled, were grown much bigger, and had made their progreſs from the place where they were firſt hatched, which was cloſe to, or upon the very Wood of the Tree, almoſt to the very outſide of the Bark of the Elm, which is uſually pretty thick; and in every one of thoſe Perpendicular Channels before mentioned, I found the Mother Fly lying dead, for the moſt part towards the entrance of the ſaid Channel.

Theſe Obſervations put me upon viewing the Wood, which lay in my Yard for Timber or Fewel, and in all the Elm which was felled laſt Spring, I found the Bark thereof as much pierced; the ſame Mother Channel, which for diſtinction ſake, I beg leave ſtill, tho improperly, to call Perpendicular (for theſe Trees lay on the Ground) and the ſame little (now as improperly called Horizontal) Channel proceeding from the Mother Channels full of Maggots, which Maggots had alſo made their way almoſt to the outſide of the Bark.

Obſerving ſome Elm, which had lain much longer in the Yard, and taking off the Bark, I found the ſame tracks both of Mother Fly and Maggots; and that at the extremities of almoſt all the Horizontal Channels made by the

Maggots; where they had ſubſiſted long enough to come to any perfection, the Bark was pierced quite through, by a hole juſt the bigneſs of the Channel, and nothing left remaining, but a ſort of a whitiſh pretty tough Skin, exactly the colour and ſize of the Maggot, at the mouth of the hole, and the reſt of the forſaken Channel perfectly filled with what I formerly preſum'd to call the Excrement of the Maggot.

Then I examined the Aſh-wood, which had lain ſome time in the Yard, and at firſt ſight, it being young, and its Bark pretty ſmooth, I perceived it full of ſmall holes; and on ſeparating it from the Tree, I found juſt the ſame ſort of work as in the Elm, and by the ſame ſort of Fly, having found ſeveral of the Mother Flyes dead in their Channels, and the ſame empty Skins at the extremities of the other Channels; only with this difference, that whereas in the Elm all the Mother Channels were Perpendicular, and the Maggot Channels Horizontal, here in the Aſh it was juſt contrary, all the Mother Channels were Horizontal, and the Maggot Channels Perpendicular; this I at firſt thought might be accidental, and peculiar to that piece of Wood, but on examination of above 100 pieces of Wood of different Trees, and felled at different times, I found it exactly to hold true in them all.

I obſerved ſeveral Oak and Maple Trees, which had been felled ſome in Winter and ſome in Summer, and the Bark remaining thereon, but could find no ſuch thing in either of them.

Explanation of the Figures in Tab. 2.

Fig. 1. *ſhews the Bark of Aſh.* Fig. 2. *The Bark of Elm.* Fig. 3. *The Worm as big as the Life lying on its Back.* Fig. 4. *The Mother Fly, with its Belly upwards, as big as the Life.* Fig. 5 & 6. *The Worm and the Fly with their Backs upward.* Fig. 7. & 9. *The Worm Magnify'd.* Fig. 8. *The Mother Fly Magnify'd.*

V. *Part of a Letter from Mr* Ralph Thoresby, *F. R. S. to Dr* Hans Sloane, *S. R. S. concerning a Leaden Coffin,* &c. *taken out of a* Roman *Burying-place near* York.

Leeds, June 17. 1702.

BEing lately at *York*, I went (as uſually) to Mr *Montague Gyles's*, to enquire if his Servants had retrieved any thing curious in the *Roman* Burying-place; where, in digging Clay for Bricks, they frequently find Urns, *&c.* Some of which are accounted for in former Tranſactions. They very lately found there a remarkable Lead Coffin, which by the Circumſtances ſeems to have been for a Perſon of Quality; 'twas 9 foot deep in the ground, whereof 6 were Clay, and 3 a black Earth; the Lead Coffin, which was about 7 foot long, was incloſed in a prodigious ſtrong one, made of Oak Planks, about 2 inches and a half thick, which beſides the Rivettings were tack'd together with Brags, or great Iron Nails, ſome of which I pull'd out of the Planks, and have by me; they are 4 inches long, the heads not Die-wiſe, as the large Nails now are, but perfectly flat, and an inch broad: I have one ſomewhat different, the Nail itſelf is half an inch broad, and thin, ſomewhat in the form of a Wedge, and the Head not round, as the others, but ſomewhat like the modern Draw-nails; but theſe old ones are generally ſquare, the 4 ſides of an equal breadth: Many of them are almoſt conſum'd with the ruſt, and the outſides of the Planks, but the heart of the Oak is firm, and the Lead very freſh and pliable; whereas one found about a year ago (whereof I have alſo a ſample) is brittle, and almoſt wholly conſumed, having no Planks to guard it: But what I was moſt ſurprized at, was, that the Bones ſhould be entire, tho probably interr'd 1500 years ago; for 'tis above ſo many Centuries ſince their Cuſtom of Burning gave place to that more natural of Burying their Dead; which, according to Monſieur *Muret*, was re-introduced by the *Antonines*, who, being Philoſophers and Virtuous Princes, could no longer endure that that kind of Cruelty ſhould be exerciſed upon Humane Bodies. I have a Thigh-bone (which is wonderful light) and the lower Jaw, which was furniſhed with all the Teeth, but ſome of them are ſince ſtoln out; but tho the Bones are light, the double Coffins were ſo heavy, that they were forced to drag them out of their old Dormitory with a Team of Horſes.

VI. *Experiments on the Production and Propagation of Light from the* Phoſphorus *in* Vacuo, *made before the Royal Society, by Mr.* Fra. Hauksbee.

Experiment I.

IN purſuance to the Commands of this Honourable Society, Having a dark Room provided, the firſt Experiment was by drawing ſome Lines on a piece of blue Paper with the *Phoſphorus*, which became immediately Luminous in the open Air, having a continual undulating Motion. This being plac'd under a Receiver, after ſome few Exſuctions, the Undulation ceas'd, but the Luminous Quality appeared to be in a great meaſure increas'd; the Receiver being farther exhauſted, it became manifeſtly brighter; and ſo continu'd, till on the Admiſſion of Air (which was gradually done) the Light ſenſibly diminiſhing all the while. But upon the Repetition of the Experiment, it was the Opinion of thoſe Gentlemen then preſent, that it did not appear altogether ſo brisk or ſo vivid as at firſt. To

Experiment II.

To 2 or 3 ſmall pieces of *Phoſphorus* in a Glaſs Diſh was added a ſmall Portion of Oyl of Vitriol, Tartar *per Deliquium*, and Oyl of Cloves, which Mixture fir'd the *Phoſphorus* in the open Air: But adding a little common Water, the Flame extinguiſh'd. This Preparation being included in a Receiver, very little light appear'd: But upon exhauſting the Air, it became very apparent, and ſent forth Vivid Steams. The Ingredients in the Diſh (at the ſame time) appear'd very much to reſemble a Boyling Flame, exhibiting a large Light; ſo that ſeveral Objects near it were render'd diſtinguiſhable, and continu'd ſo till the Air was admitted, at which time it became Opake. Nor would ſhaking the Engine (by which means the Mixture in the Diſh was put in motion) produce any ſenſible Recovery of Light.

Experiment III.

A ſmall quantity of the pre-mention'd Ingredients being put into a Bottle with a narrow neck, and included under a Receiver, appear'd then with very little Light; But on withdrawing the Air the *Phoſphorus* began to be Luminous, and continu'd to increaſe, in proportion to the Rarification of the Air, iſſuing out of the Bottle in a Pyramidical form. At laſt (notwithſtanding the Receiver was well exhauſted) the Vivid Steams that were then emitted were ſo fine and ſubtile as to aſcend in ſo thin a medium, reaching the upper parts of the Receiver (which was not tall) deſcending again by the ſides thereof. Upon letting in the Air the Light perfectly vaniſh'd; and it would have been in vain (as I have often try'd) to have waited in expectation of its Recovery in the open Air.

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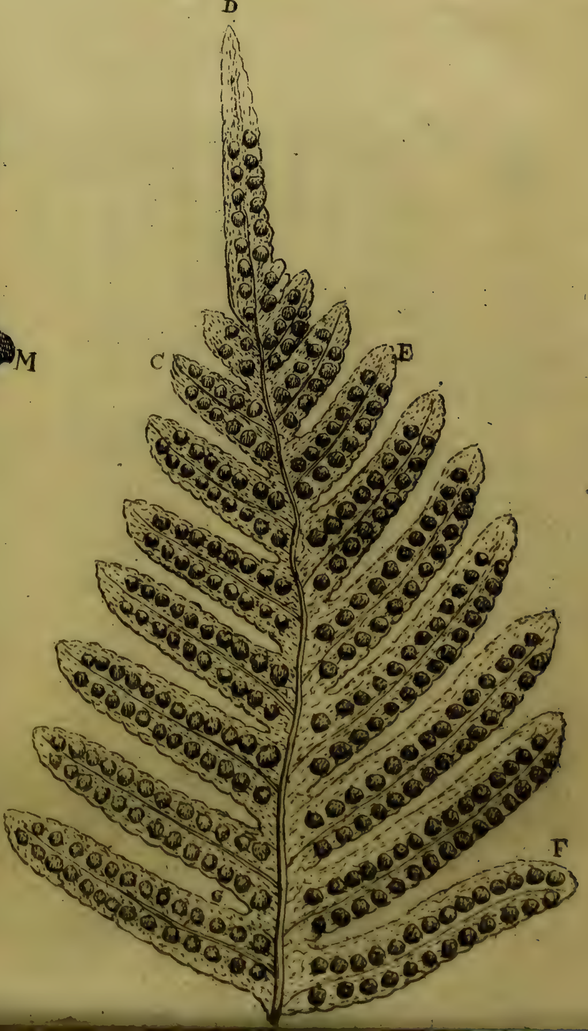
BRITISH MUSEUM NATURAL HISTORY

fig: 1.



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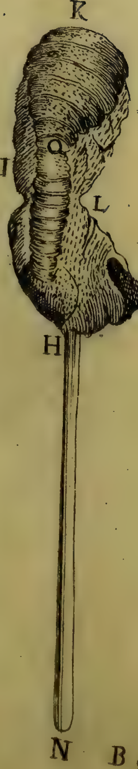

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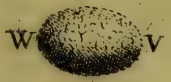

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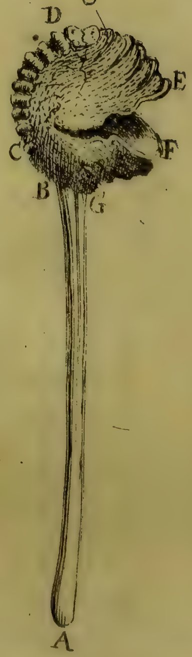

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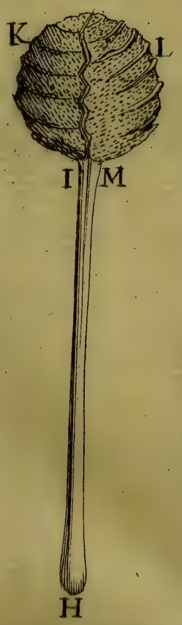

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PHILOSOPHICAL TRANSACTIONS.

For the Month of March, *1705.*

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I. *Obſervations on the Seed-Veſſels and Seeds of* Polypodium. *In a Letter from Mr* Anthony Van Leeuwenhoek, *F. R. S.*

Delft *in* Holland, *April* 24, 1705.

WHen I was a few years ago at a place where *Polypodium* grew, I viewed the Seed Veſſels, that were in great numbers upon its Leaves ; and when I placed ſome pieces of a Leaf before a Microſcope, I obſerved, as did ſeveral others that were with me, the Seed Veſſels appearing like ſo many round Globules ; and that ſoon one and ſoon another of them burſt before our Eyes, which ſpectacle ſeem'd exceeding ſtrange to us. And lately, in the middle of the laſt Winter, there fell into my hands two Leaves of Fern, that grew upon the ſtump of an old Willow Tree, and were almoſt wither'd ; the which Leaf we call Oak Fern.

This Leaf had a great deal of Seed in it, but the Seed Veſſels thereof were much larger than the Seeds of the Fern that grow in the Country.

I obſerved ſeveral little Bundles or Parcels of theſe Seed Veſſels, ſometimes thirteen of them lying in a row by one another.

Having never taken notice before, how large the Plant called the Oak Fern grows upon the Trees, I betook my ſelf in the month of *February* laſt to a certain place, where there were old Willow Trees growing upon the Banks of a Canal, the which Trees were no taller than the length of a Man : The Boughs or Branches of which had been lopt off for four or five years together; which are moſtly uſed by the Boors to make Hedges or Fences for their Grounds and Dwelling places; a great many of which Willow Trees, by the Lopping of their Branches, periſh: And upon the rotten Wood of ſuch Trees grows the *Polypodium* or Fern.

From three or four of thoſe Trees I pull'd off the Fern, and I obſerved in all thoſe that I meddl'd with, the Plant was no larger than a ſingle Leaf.

Theſe Leaves were of different ſizes, ſome ten times larger than others, and ſome of them were not above two fingers broad, yet they alſo had Seed in them.

From theſe Obſervations, I infer, that the great Leaves had grown ſeveral years before they arrived at their preſent bigneſs; and the more, becauſe the Roſe like parts were not near ſo large upon the little Leaves as they were upon the great ones; and conſequently the Seed Veſſels fewer in number upon the one than the other.

Among that Fern that I brought home with me, I planted eight or ten that had thick ſhort Roots; and from which Roots there came new ſmall Branches, and moſtly two ſuch Branches ſprung out of one Root: But I had one from whence four proceeded. I planted them in a Flower-pot, with fitting Earth about them, that I might purſue my Obſervations as often as I found my ſelf diſpoſed to it.

I cauſed my Painter to draw the greateſt part of one of the largeſt Plants, to ſhew you the many Seed Veſſels that are upon the ſame, together with the unſpeakable number of ſmall Seeds that are ſhut up in each Veſſel.

Fig. 1. A B C D E F repreſents the largeſt part of an Oak Fern Plant, which I call a Leaf, becauſe it has no Root, but only a Stalk; and foraſmuch as part of the Leaf was divided into ſeventeen Branches, whereof A B G is one, we may conclude that the whole Leaf conſiſted of a great many more.

Now I have often counted in one Branch only of ſuch a piece of a Leaf, and in one row only of ſuch a Branch as deſcribed by A B, 13 of thoſe little Particles, which to the naked Eye appear like Roſes; and conſequently in the whole Branch A B G, ſix and twenty of the ſame in two Rows, which I ſhall call Seed Veſſels; and when I ſeparated one of theſe Seed Veſſels from the reſt, I obſerved that all of them had very ſhort kind of Stalks, whereby they were faſtened to the Leaf, and by which they received their Increaſe, but to the Eye appear'd no bigger than a Point, and the Leaf ſeem'd clearer or more tranſparent there, in which place I judge there was a Canal or Vein of the Leaf.

Having ſeparated one of theſe Roſe-like parts from the Leaf, and alſo as well as I could the Seed Veſſels of which it was compoſed, from one another, I found that the number of thoſe Seed Veſſels amounted to 149.

But in obſerving others I did not find the number ſo great, which was at ſometimes 120, at others 130.

Almoſt all the Seed Veſſels were open, and in ſome of them not the leaſt appearance of any Seed.

This openneſs ſeem'd at firſt very ſtrange to me, becauſe I could not perceive in any of them that it was occaſion'd by any burſting or breaking in pieces; but when I conſider'd the matter better, I fancied to my ſelf that Nature had ordered it ſo in thoſe Seed Veſſels, that as ſoon as the Seed was ripe, and received no further Nouriſhment, the Seed Veſſels ſhould open of courſe.

Fig, 2. H I K L M repreſents one of thoſe Seed Veſſels, that was open'd more than the reſt, and whereby the Seeds, as I imagine, were thrown out, as it always happens in thoſe Seed Veſſels that open of themſelves; for I could not perceive at the Orifice the leaſt Rent or Breach: The ſaid Orifice is repreſented by L M.

In the ſaid Figure, between H and O, you may obſerve 8 Screw-like parts; and of this Configuration are all the Seed Veſſels.

Let us ſuppoſe now that when the Seed is ripe, and receives no further Nouriſhment,it,and particularly its Shell or Veſſel, which for the moſt part is compoſed of a thin Membrane, ſhrinks in, by reaſon that its moiſture in dry weather is all exhal'd; now this ſhrinking in is greater in the 8 Screw-like parts, that are deſcribed between H and O, than in any other part of the Seed Veſſel, becauſe that the Screw-line parts are there of more than an ordinary thickneſs, in compariſon of the other parts of the Seed Veſſel; by which extraordinary ſhrinking the Seed Veſſels are forc'd open, and the incloſed Seed thrown out.

I have met with ſome of the ſaid Fern Leaves, in which the Seed Veſſels had not been yet open'd, and conſequently had ſhed none of their Seeds.

I have opened ſeveral of theſe Seed Veſſels, and viewed the Seeds with a Microſcope, it being impoſſible for me to ſee them with my naked Eye, or even with common Spectacles: I have counted above 50 Seeds in one of thoſe Seed Veſſels, the which Seeds appeared thro the Microſcope like theſe 3, which I have cauſed to be drawn Fig. 3. P.Q.R.

I placed ſome of thoſe Seeds before a Microſcope, that was more magnifying than the laſt, and charged the Painter to draw it juſt as big as it appeared to him thro the ſame Glaſs, as you may ſee in Fig. 4. S T. and foraſmuch as the ſame Seed ſeem'd much greater to my Eye, I cauſed it to be ſo drawn, or rather ſmaller than it really appear'd to me, as in Fig. 5. V W.

And tho the Seeds did appear as ſmall as in Fig. 3. yet one might perceive the Spotted Particles wherewith the Seeds were adorned.

Now if we turn our thoughts upon the Stalks of theſe Seed Veſſels, as they are repreſented in Fig. 2. N H, and if we let them wander beyond our ſight, which can penetrate no farther than into the Internal Canals or Veſſels, of which there lye an unſpeakable number in the ſaid Stalks, we may ſafely affirm, not only that the Seed Veſſels are produced and fed from the ſame, but alſo that in ſuch Seed Veſſels there may lye 50 or more Seeds, each of which may be indued with particular Canals or Veſſels; and have moreover a Shell or Membrane without, and a Plant within; all which lye in ſo exceeding ſmall a Compaſs, and have ſuch an unſpeakable number of Veſſels in them, that one can hardly form any manner of Idea of them.

I cauſed the Painter to draw another Seed Veſſel, which was not open as the former: And whereas in Fig. 2. the Screw-like parts of the Seed Veſſel are placed oppoſite to the ſight, in this laſt the ſame parts appear ſideways.

Fig. 6. A B G repreſents the Stalk thereof, B C D E F G the Seed Veſſel itſelf, and E F the opening of that Veſſel whereby it diſcharges its Seed.

I cauſed alſo another Seed Veſſel to be drawn, that had not yet open'd itſelf, and conſequently in which the Seeds are ſtill ſhut up.

Fig. 7. H I M ſhews the Stalk, and I K L M the Seed Veſſels, in which the Skrew-like parts are intercepted from the ſight; and it is ſo placed that you can't at all perceive whereabouts the opening ſhall happen.

In the ſaid Seed Veſſel you may obſerve the wonderful Fabrick of the Membrane whereof it is compoſed, and the exact Order and Regularity of the Seams or Ribs thereof; but when I ſhew'd a certain Gentleman the ſame Order and Uniformity in another Creature, he ask'd me to what end it was ſo Created, ſince it was never to be ſeen by the naked Eye.

The Shell or Skin of theſe Seeds is compoſed of ſo exceeding a thin Membrane, that the Wind, or even the Seeds themſelves that are encloſed by it, would eaſily break it, were it not fortified or ſtiffned by thoſe parts that I call the Ribs or Seams thereof, the which are much thicker than the reſt of the Membrane, and thereby both the Seed and the Veſſels themſelves are preſerved.

When I ſhew'd a certain Gentleman, by the help of a Microſcope, one of theſe Seed Veſſels, as alſo the Seeds that I had taken out of it, he was very deſirous to know of what ſubſtance thoſe Seeds were compoſed ; but I thought 'twas impoſſible for me to ſatisfie him by Diſſecting one of thoſe Seeds ; yet, having further conſider'd of his Requeſt, I found out a means of breaking one of theſe ſmall Seeds ſo cleverly, that no foreign Matter ſhould intervene, or be mixt with it.

In doing this, I was mightily ſurpriz'd to find a great deal of Oyl coming out of one of them ; and as each of theſe Seeds was of a Yellowiſh Colour, ſo was the Oyl alſo, where 'twas a little thick ; but where it was thinner, it was as clear as any Water ; the other Particles, that lay in and about the Oyl, were of an exceeding ſmallneſs.

I made but one little Hole or Breach in the Seed, whereby to ſqueeze out the Oyl, and the other Particles wherewith it was filled ; which having done, I obſerved that the Skin or Membrane of the Seed had no Colour at all in it ; and then I could ſee a great many more Figures in the ſaid Membrane, than were diſtinguiſhable in it before : Ad as all Seeds, that are viewed with any exactneſs, may be diſcover'd to have two Membranes, ſo it is not improbable that theſe have two likewiſe.

Now when we conſider the exceeding ſmallneſs of the abovemention'd Seeds, 'tis eaſie to conceive how the ſame, after that they are full ripe, may be ſcatter'd abroad with a brisk Wind, and ſome of 'em conſequently may fall upon old Rotten Trees, and from thence receive their Nouriſhment and Increaſe.

I mention'd before, how the Seed Veſſels upon the Leaves of Fern, open'd themſelves (whilſt I was obſerving them) in order to ſhed their Seed.

For my further ſatisfaction in this matter, I took a Fern Leaf, in which the Seed Veſſels being quite ripe, were for the moſt part open, and had diſcharged their Seed, and put it into boyling hot Water; in this expectation, that the hot Water inſinuating itſelf immediately into the Screw-like parts, as they are repreſented in Fig. 2. between H and O, would ſo extend or ſwell out thoſe parts, that the Seed Veſſels would reſume the ſame figure or appearance as when they were full of Seed; and this Experiment I repeated ſeveral times, and always obſerved that almoſt all the Seed Veſſels ſhut up themſelves, juſt after the ſame manner as they were before they diſcharged their Seed; and when I ſpread thoſe Seed Veſſels abroad, and let them dry again, they were all of them as open as that which is repreſented by Fig. 2.

II. *Part of a Letter from Mr* Ralph Thoresby, *F. R. S. concerning Pewter Money, Coyn'd in* Ireland, *by the late King* James.

Leeds, *June* 7, 1704.

Honoured Sir,

"THis brings you an account of a Curioſity that relates to the late King *James*'s *Iriſh* Moneys, which I am apt to think you never heard of, *viz.* a *Crown piece of Pewter*, inſcribed *Melioris teſſera fati.* 'Twas ſent me by the Gentleman who found them in the Treaſury at *Dublin*; whoſe account is ſo particular and curious, that I will chooſe to give it you in his own words. " That King *James*, having turned all the Braſs Guns of " *Ireland*, and all the Braſs and Copper Veſſels of Pro- " teſtants that he could ſeize, into Coyn, *viz.* Half- " Crowns ſomewhat bigger than an *Engliſh* Half-penny, " Shillings broader, but not ſo thick as a Farthing, and " Six pences in proportion; it was order'd to paſs cur- " rent in all Payments, even in Bonds, and diſcharge of " Judgments and Statutes; (inſomuch that if Ages to " come knew not the reaſon, they would admire to be " told, that there was a time when men abſconded, to " avoid receiving their Debts, as many here did:) But " theſe ſtocks of Metal being all ſpent (which he began " to Coyn in *June* 1689.) and no Circulation to bring " them back into his Treaſury, he call'd in all that he " had Coyned, and the Half-Crowns, which before

" were ſtamped with a Face, were re-ſtamped with his
" *Effigies* on Horſeback, and then paid out to thoſe who
" brought them in, as Crowns; and the ſmaller Coyns
" were melted down, and re-coyned again under the
" ſame Denominations, but with leſs Metal. After the
" turn was ſerved by this Stratagem, he had not wherewithal
" to import Copper and Braſs; but, for want of
" it, fell foul on the Pewter-Diſhes, *&c.*——And the
" piece I ſent you of that Metal was Coyned for five
" Shillings; and the Proclamation to make it paſſable
" was as ready as the Stamps, for it was prepared: But
" King *William* paſſing the *Boyne*, prevented their Proclaiming
" it. There was very little of it Coyned, for
" our Government could meet with none of it; until
" one day, rummaging all their Tinkerly Treaſure, that
" they had left behind them in *Dublin* when they were
" routed, by accident I met with one Bag of 150 of thoſe
" Pieces. So that the Piece I ſent you, altho it's of no Intrinſick
" Value, it's a Rarity; and had I thought it would
" have been acceptable, I would have ſent you a Specimen
" of every ſort that he had Coyned and Re-coyned
" here. I am,

Sir, *Your very Humble Servant,*

Dublin, *Novemb. the 27th,* 1696.

Tho. Putland.

This Valuable Curioſity has the ſame Inſcription on both ſides, as the common Braſs Crowns; but there is this Legend added upon the Rim of it, *MELIORIS TESSERA FATI ANNO REGNI SEXTO.*

III. *A*

This Illuſtrious Society having been pleaſed to accept of Mr *Townley*'s and my Obſervations compared, concerning the height of the Mercury, *&c.* for divers years, to the year 1702, which were publiſhed in the Tranſactions; it may not, I hope, be unacceptable to continue theſe Obſervations as far as Mr *Towneley* hath gone with them, till his Removal from *Towneley.*

And having room, I have added his Obſervations alſo of the Weather and Winds on the firſt day of every month, together with my own at the ſame time, extracted out of my larger Tables, now in the Society's cuſtody. From whence theſe things may be obſerved.

1. That (as I have often obſerved in ſome other Papers) there is every year much more Rain falleth at *Towneley* than *Upminſter.*

By the aſſiſtance of an Ingenious Learned Member of this Society, I have an Extract of the Rain at *Paris* and *Liſle*, as far as the *French* have publiſhed their Obſervations. And by comparing the Rain of one place with that of another, I find that there is about twice as much Rain falleth at *Townley*, as doth either at *Upminſter*, *Paris*, or *Liſle.* Mr *Towneley* hath formerly obſerved in one of the Tranſactions, that as much more Rain falleth at *Townley* as *Paris.* And Mr *de la Hire* obſerves, that more Rain falleth at *Liſle* than *Paris.* But *Towneley* doth far exceed, as hath been ſaid, and will appear by particulars.

At *Liſle*, one year with another, the Depth of the Rains amount to 22 inches 3 lines, *Paris* meaſure, or 23 in. 3 l. which make about 23 $\frac{1}{2}$ inches *Engliſh*, or 24 $\frac{1}{2}$. At *Paris*, one year with another, they amount to 20 inches 3 $\frac{1}{2}$ lines *Paris* meaſure, which is near 22 inches *Engliſh.* But at *Towneley*, one year with another, according to Mr *Towneley*'s computation formerly, the Rains amount to above 41 inches depth. And by taking eight other years, in which the Rain was obſerved both at

Towneley and *Upminſter* (*viz.* from 1696 to 1704.) I nd that all the 8 years Rain at *Towneley* amounteth to bove 1700 *l. Troy*, at *Upminſter* 823 *l.* only. Which ſaid ſumms being divided by 8, give 212 *l.* ½, one year with another, at *Towneley*, and near 103 *l.* at *Upminſter*. Each of which ſumms being doubled, and making a Decimal Fraction of the laſt Figure, doth nearly give the number of inches, which all the Rain would have riſen to, if the Earth had not ſwallowed it up, *viz.* 42 ½ inches at *Towneley*, and about 20 ½ inches at *Upminſter*. Wherefore the Rain at *Upminſter* is leſs than at *Paris*, at *Paris* than at *Liſle*, and at every one of the places leſs than at *Towneley* by much. The reaſon of which vaſt ſurmount at *Towneley*, is doubtleſs from the height of the Hills thereabouts, which retard or ſtop the Weſterly Clouds : From which Point the Winds blow more than any other here in *England*. But

2. Notwithſtanding the great diſproportion of Rain between one place and another, yet there is a great agreement between our Barometers ; one Riſing or Falling when the other doth ; and that much, or little, as the other doth, although not always exactly in the ſame proportion.

And this is what I find Monſieur *Maroldi* hath obſerved, by comparing his Obſervations at *Paris* with mine at *Upminſter*, in the years 1697 and 1698. Only at *Paris* the ☿ is commonly 3 or 4 lines lower than at *Upminſter*. And ſo it appears to be at *Towneley*, from this and ſome other Tables, *viz.* 3 or 4 tenths of an inch lower at *Towneley* than at *Upminſter*. Which is an argument that *Towneley* and *Paris* are ſituated higher above the ſurface of the Sea than *Upminſter* (which is nearly in the ſame level with *London*) is.

3. Another thing ſhewn by the foregoing Table, is, That there is ſome agreement between the Winds at *Towneley* and *Upminſter*. Which although not always

exactly in the ſame Point, yet do often tend the ſame way, blowing within a Point or two perhaps of the ſame courſe; eſpecially when the Wind is ſomewhat ſtrong. Or if the Winds have differed, yet the Scudd (as the Seamen call the current of the Clouds) hath commonly ſhown the motion of the upper Air to agree thereto.

This I ſay doth often happen, though not always. And this alſo Monſieur *Maraldi* hath obſerved at *Paris* in the aforeſaid years, *viz.* " That there are a great " many days, during the different Seaſons of the year, " where the Winds are the ſame in both Places, [*i. e.* " *Paris* and *Upminſter.*] When the Wind was the ſame, " both in one part and the other, it was ordinarily " pretty ſtrong, and of long continuance. And alſo he " obſerved that the Winds had changed alike in both " Places. *Vid. Hiſt. de l' Acad. Roy. des Sciences An.* 1699.

IV. *Aſtronomiæ Cometicæ* Synopſis, *Autore* Edmundo Halleio *apud* Oxonienſes *Geometriæ Profeſſore* Saviliano, & Reg. Soc. S.

VEteres *Ægyptii* & *Chaldæi*, ſiqua fides *Diodoro Siculo*, longa obſervationum ſerie inſtructi, Cometarum ἐπιτολὰς prænuntiare valuerunt. Cum autem iiſdem artibus etiam Terræ-motus ac tempeſtates prævidiſſe dicantur, extra dubium eſt Aſtrologiæ potius calculo fatidico, quam Aſtronomicis motuum Theoriis eorum de his rebus ſcientiam referendam eſſe. Ac vix alia à Græcis utriuſque populi victoribus reperta eſt apud eos doctrina; adeo ut eam, quam nunc eouſque proveximus Aſtronomiam, Græcis ipſis, præſertim magno *Hipparcho*, uti inventoribus, acceptam debeamus. Apud hos vero *Ariſtotelis* ſententia, qui Cometas nihil aliud eſſe voluit quam Vapores ſublunares vel etiam Meteora aerea, tantum effecit, ut hæc Aſtronomicæ ſcientiæ pars longe ſubtiliſſima, omnino neglecta manſerit, cum nemini operæ pretium viſum fuerit, vagas & incertas fluitantium in æthere vaporum ſemitas adnotare ſcriptiſque mandare; unde factum ut ab illis nihil certi de motu Cometarum ad nos tranſmiſſum reperiatur.

Seneca autem Philoſophus, perpenſis duorum inſignium ſui temporis Cometarum Phænomenis, non dubitavit iis loca inter corpora cœleſtia aſſignare, Sydera eſſe cum mundo duratura exiſtimans, quanquam Motus eorum legibus nondum compertis regi fateatur. Tandemque Vaticinio non irrito promittit aliquando futura ſecula, quibus hæc tam occulta *dies extraheret ac longioris ævi diligentia:*

tia: quibuſque admirationi foret hæc *Veteres* neſcire potuiſſe; poſtquam *Demonſtraverit aliquis* Naturæ Interpres *in quibus Cœli partibus Cometæ errent, quanti, qualeſque ſint.* Ab hac autem *Senecæ* ſententia in diverſas partes abiit pene omnis Aſtronomorum Cohors; ac ipſe *Seneca*, neque Phænomena Motus quibus opinionem hanc tueretur, neque tempora adſcribere dignatus eſt, quæ poſteris ad hæc definienda uſui forent. Ac evolutis plurimis Cometarum Hiſtoriis, nihil omninò invenio quod huic negotio inſervire poſſit, ante annum à *Chriſto* nato 1337. quo *Nicephorus Gregoras* Hiſtoricus & Aſtronomus *Conſtantinopolitanus* nobis Cometæ ſemitam inter fixas ſatis accurate deſcripſit: tempora autem nimis laxe conſignavit, ita ut non niſi quod abhinc quadringentis pene Annis apparuerit, lubricus & incertus hic Cometa Catalogo quem damus inſeri mereatur. Dein Cometa anni 1472 omnium velociſſimus ac terris proximus *Regiomontanum* habuit obſervatorem. Hic magnitudine ac Comâ terribilis, unius diei ſpatio 40 gradus ſub circulo Cœli maximo emenſus eſt, ac omnium primus eſt de quo obſervata idonea ad nos pervenere. Quotquot autem Cometas conſiderarunt, uſque ad tempora *Tychonis Brahe* magni illius Aſtronomiæ reſtauratoris, eos ſublunares eſſe autumârunt, adeoque parvi penderunt, utpote pro Vaporibus habitos.

Anno autem 1577, (*Tychone* jam ſtudio aſtrorum ſerio incumbente, comparatiſque Machinis ingentibus pro dimetiendis cœli arcubus, majori cum cura & certitudine quam Veteribus ſperare fas erat) Emerſit Cometa ſatis conſpicuus, cui obſervando ſtrenue ſeſe accinxit *Tycho*: multiſque & fidis experimentis deprehendit, nulli quæ ſentiretur Parallaxi diurnæ obnoxium fuiſſe, adeoque non tantum non fuiſſe Vaporem aereum, ſed & etiam multo ſuperiorem extitiſſe Lunâ: immo nihil obſtabat quin inter ipſos Planetas collocaretur; fruſtra interim contra obſtrepentibus Scholaſticorum nonnullis.

Tychonis vero eximiam in obſervando induſtriam excepit *Kepleri* ſagaciſſimum & pene divinum ingenium. Hic *Tychonis* laboribus fretus Syſtema Mundi verum & Phyſicûm adinvenit, ac ſcientiam Aſtronomicam in immenſum auxit; Monſtrato ſc. Planetas omnes in Planis per Solis centrum tranſeuntibus revolvi, Curvaſque Ellipticas deſcribere, eâ lege, ut Areæ Sectorum Ellipticorum, ad centrum Solis in Ellipſeos foco conſtituti, temporibus, quibus deſcribantur arcus, ſemper proportionales ſint. Invenit etiam Diſtantias Planetarum à Sole eſſe in ſeſquialtera ratione temporum periodicorum, ſive Cubos diſtantiarum eſſe ut Quadrata Temporum. Tanto autem Artifici affulſere duo Cometæ, quorum alter maxime illuſtris. Ex horum obſervatis concluſit *Keplerus* non uno parallaxis annuæ indicio, Cometas inter Orbes planetarum liberrime quaquaverſum ferri, motu quidem non multum à rectilineo diverſo, ſed quem nondum definire licuit. Ac *Hevelius*, *Tychonis* æmulus, *Kepleri* veſtigiis inſiſtens, eandem Hypotheſim Motus rectilinei amplexus eſt, ipſe plurium Cometarum Obſervator perquam ſubtilis. Cœlo tamen Calculum ſuum non penitus conſentire queſtus eſt, Viamque Cometicam verſus Solem incurvari ſuboluit.

Tandem de ſummo Cœlo lapſus eſt prodigioſus ille Cometa Anni 1680. quaſi Caſu perpendiculari Solem petens, & exinde pari velocitate aſſurgens: Hic per quatuor Menſes continuos viſus, inſigni ac peculiari Curvitate Orbitæ ad inveſtigationem Motus Theoriæ præ cæteris idoneus erat: Inſtructis autem jampridem Regiis Obſervatoriis, *Pariſienſi* & *Grenovicenſi*, ac Aſtronomorum Clariſſimorum curæ commiſſis, accidit ut hujus Cometæ Motus apparens, quantum forſan mortalibus fas eſt, accuratiſſime à *Caſſino* & *Flamſtedio* obſervaretur.

Non multo poſt, dum Geometrarum Princeps illuſtriſſimus *Newtonus* operam dabat *Principiis Philoſophiæ Mathematicis*; non ſolum Inventa *Kepleri* in Syſtemate Planetario neceſſariò locum habere demonſtravit: verum etiam

Cometarum Phænomena omnia ex iiſdem Principiis evidenter conſequi. Id quod exemplo prædicti Cometæ anni 1680 abunde illuſtravit, modumque docuit Geometrice conſtruendi Orbitas Cometarum; Problemaque arduum ac tanto Oedipo dignum ſumma cum omnium admiratione reſolvit. Cometam autem hunc in orbe parabolico Solem circumiiſſe probat, ita ut Areæ ad Centrum Solis æſtimatæ Temporibus proportionales fuerint.

Tanti viri veſtigia inſecutus eandem methodum calculo Arithmetico accommodare aggreſſus ſum, nec irrito Conamine. Undique enim conquiſitis Cometarum Obſervationibus, Tabellam hanc, immenſi pene Calculi fructum, obtinui, exiguum quidem ſed non ingratum Aſtronomis munus. Hi etenim numeri vim habent omnia quæ de motu Cometarum hactenus obſervata ſunt accuratiſſime repræſentandi, ope ſolius Tabulæ Generalis inſequentis, cui adornandæ nullis ſane peperci laboribus, ut perfecta prodiret, utpote Poſteritati conſecrata ac cum Scientia Aſtronomica duratura.

Cometarum Omnium hactenus rite Obſervatorum, Motuum in Orbe Parabolico Elementa Aſtronomica.

Cometæ Anni.	Nodus Aſcend.	Inclin. Orbitæ.	Perihelion. in Orbe.	Perihelion in Ecliptica	Latitudo Perihelii	Diſtant. Perihelia à Sole.	Log. diſt. Periheliæ à Sole.	Temp. æquat. Perihelii Londini.
	gr. ' ''	gr. ' ''	gr. ' ''	gr. ' ''	gr. ' ''			die. h. '
1337	♊ 24. 21. 0	32. 11. 0	♉ 7. 59. 0	♉ 12. 45. 15	22. 4[illegible]. 30 B	40666	9. 609236	Junii 2. 6. 25
1472	♑ 11. 46. 20	5. 20. 0	♉ 15 33. 30	♉ 15. 4[illegible]. 20	4. 25. 50 A	54273	9. 734584	Feb. 28. 22. 23
1531	♉ 19. 25. 0	17. 56. 0	♒ 1. 39.	♒ [illegible]. 40. 15	17. 3. 05 B	50700	9. 753583	Aug. 24. 21. 18½
1532	♊ 20. 27. 0	32. 36. 0	♋ 21. 7. 0	♋ 16. 59. 40	15. 57. 00 B	5091	9. 706803	Oct. 19. 22. 12
1556	♍ 25. 42. 0	32. 6. 30	♑ 8. 50. 0	♑ 11 0. 00	31. 10. 20 B	46390	9. 666424	Apr. 21. 20. 3
1577	♈ 25. 52. 0	74. 32. 45	♌ 9. 22. 0	♍ 7. 53 00	69. 35. 20 A	18342	9. 263447	Octo. 26. 18. 45
1580	♈ 18. 57. 20	64. 40. 0	♋ 19. 5. 50	♋ 19. 17. 10	64 40. 0 B	59628	9. 775450	Nov. 28. 15. 00
1585	♉ 7. 42. 30	6. 4. 0	♈ 8. 51. 0	♈ 8. 59. 1[illegible]	2. 55. 25 A	109358	0. 038850	Sept. 27. 19. 20
1590	♍ 15. 30. 40	29. 40. 40	♏ 6. 54. 30	♏ 2. 55. 50	22. 45. 50 A	57661	9. 760882	Jan. 29. 3. 45
1596	♒ 12. 12. 30	55. 12. 0	♏ 18. 16. 0	♏ 22. 44 35	54. 44. 30 B	51293	9. 710058	Julii 31. 19. 55
1607	♉ 20. 21. 0	17. 2. 0	♒ 2. 16. 0	♒ 1. 29. 40	16. 10. 5 B	58680	9. 768490	Oct. 16. 3. 50
1618	♊ 16. 1. 0	3[illegible]. 34. 0	♈ 2. 14. 0	♈ 6. 10. 00	35. 50. 0 A	37975	9. 579498	Oct. 29. 12. 23
1652	♊ 28. 10. 0	79. 28. 0	♈ 28. 18. 40	♊ 10. 41 35	58. 14. 0 A	84750	9. 928140	Nov. 2. 15. 40
1661	♊ 22. 30. 30	32. 35. 50	♋ 25. 58. 40	♋ 21. 37. 30	17. 17. 0 B	44851	9. 651772	Jan. 16. 23. 41
1664	♊ 21. 14. 0	21. 18. 30	♌ 10. 41. 25	♌ 8. 40. 35	16. 1. 50 A	102575½	0. 011044	Nov. 24. 11. 52
1665	♏ 18. 02. 0	76. 05. 0	♊ 11. 54. 30	♉ 24. 6. 35	23. 8. 0 B	10649	9. 027309	Apr. 14. 5. 15½
1672	♑ 27. 30. 30	83. 22. 10	♉ 16. 59. 30	♋ 9. 26. 00	69. 27. 40 B	69739	9. 843476	Feb. 20. 8. 37
1677	♏ 26. 49. 10	79. 03. 15	♌ 17. 37. 5	♋ 16. 21. 05	75. 44. 10 B	28059	9. 448072	Apr. 26. 00. 37½
1680	♑ 2. 2. 0	60. 56. 0	♐ 22. 39. 30	♐ 27. 26. 50	8. 11. 10 A	00612½	7. 787106	Dec. 8. 00. 6
1682	♉ 21. 16. 30	17. 56. 0	♒ 2. 52. 45	♒ 2. 0. 30	16. 59. 20 B	58328	9. 765877	Sept. 4. 07. 39
1683	♍ 23. 23. 0	83. 11. 0	♊ 25. 29. 30	♋ 10. 36. 55	82. 52. 00 B	56020	9. 748343	Julii 3. 2. 50
1684	♐ 28. 15. 0	65. 48. 40	♏ 28. 52. 0	♐ 15. 15. 25	26. 35. 20 A	96015	9. 982339	Maii 29. 10. 16
1686	♓ 20. 34. 40	31. 21. 40	♊ 17. 00. 30	♊ 16. 24. 00	31. 17. 35 B	32500	9. 511883	Sept. 6. 14. 33
1698	♐ 27. 44. 15	11. 46. 0	♑ 00. 51. 15	♑ 0. 47. 20	0. 38. 10 A	69129	9. 839660	Oct. 8. 16. 57

Hæc Tabula vix indiget explicatione, cum ex titulis ſatis pateat quid ſibi velint Numeri. Diſtantiæ autem periheliæ æſtimantur in ejuſmodi partibus quales media diſtantia Terræ à Sole habet centies millenas.

Tabula

Tabula Generalis pro Supputando Motu Cometarum in Orbe Parabolico.

Medius motus.	*Angulus à perihelio.*	*Logarithmus pro diſtantiâ à Sole.*	*Medius motus.*	*Angulus à perihelio.*	*Logarithmus pro diſtantiâ à Sole.*
°	gr. ′ ″		°	gr. ′ ″	
1	1. 31. 40	0. 000077	31	42. 55. 07	0. 062400
2	3. 3. 15	0. 000309	32	44. 3. 16	0. 065835
3	4. 34. 43	0. 000694	33	45. 10. 26	0. 069316
4	6. 6. 0	0. 001231	34	46. 16. 35	0. 072839
5	7. 37. 1	0. 001921	35	47. 21. 36	0. 076396
6	9. 7. 44	0. 002759	36	48. 25. 33	0. 079984
7	10. 38. 2	0. 003745	37	49. 28. 29	0. 083604
8	12. 7. 53	0. 004876	38	50. 30. 23	0. 087249
9	13. 37. 17	0. 006151	39	51. 31. 11	0. 090912
10	15. 6. 6	0. 007564	40	52. 30. 54	0. 094594
11	16. 34. 20	0. 009115	41	53. 29. 42	0. 098298
12	18. 1. 54	0. 010798	42	54. 27. 32	0. 102019
13	19. 28. 47	0. 012609	43	55. 24. 22	0. 105752
14	20. 54. 53	0. 014550	44	56. 20. 11	0. 109490
15	22. 20. 14	0. 016607	45	57. 15. 5	0. 113240
16	23. 44. 43	0. 018783	46	58. 9. 2	0. 116995
17	25. 8. 22	0. 021072	47	59. 2. 5	0. 120756
18	26. 31. 7	0. 023470	48	59. 54. 13	0. 124518
19	27. 52. 55	0. 025969	49	60. 45. 26	0. 128278
20	29. 13. 52	0. 028551	50	61. 35. 45	0. 132035
21	30. 33. 39	0. 031263	51	62. 25. 14	0. 135792
22	31. 52. 31	0. 034045	52	63. 13. 50	0. 139541
23	33. 10. 23	0. 036916	53	64. 1. 38	0. 143288
24	34. 27. 12	0. 039864	54	64. 48. 38	0. 147029
25	35. 42. 59	0. 042892	55	65. 34. 50	0. 150762
26	36. 57. 41	0. 045989	56	66. 20. 14	0. 154482
27	38. 11. 20	0. 049154	57	67. 04. 51	0. 158192
28	39. 23. 56	0. 052383	58	67. 48. 22	0. 161890
29	40. 35. 26	0. 055668	59	68. 31. 51	0. 165578
30	41. 45. 50	0. 059010	60	69. 14. 16	0. 169254

Tabula Generalis pro Supputando

Medius motus.	*Angulus à perihelio.*	*Logarithmus pro diſtantiâ à Sole.*	*Medius motus.*	*Angulus à perihelio.*	*Logarithmus pro diſtantiâ à Sole.*
°	gr. ′ ″		°	gr. ′ ″	
61	69. 55. 58	0. 172914	91	86. 20. 34	0. 274176
62	70. 36. 56	0. 176557	92	86. 46. 20	0. 277239
63	71. 17. 16	0. 180188	93	87. 11. 43	0. 280284
64	71. 56. 56	0. 183803	94	87. 36. 45	0. 283306
65	72. 35. 57	0. 187404	95	88. 01. 27	0. 286308
66	73. 14. 15	0. 190978	96	88. 25. 49	0. 289293
67	73. 51. 59	0. 194540	97	88. 49. 48	0. 292252
68	74. 29. 6	0. 198085	98	89. 13. 32	0. 295201
69	75. 05. 38	0. 201614	99	89. 36. 54	0. 298122
70	75. 41. 35	0. 205122	100	90.00.00.	0. 301030
71	76. 16. 56	0. 208612	102	90. 45. 14	0. 306782
72	76. 51. 43	0. 212080	104	91. 29. 18	0. 312469
73	77. 25. 57	0. 215529	106	92. 12. 14	0. 318060
74	77. 59. 41	0. 218963	108	92. 54. 4	0. 323587
75	78. 32. 54	0. 222378	110	93. 34. 52	0. 329042
76	79. 5. 35	0. 225769	112	94. 14. 40	0. 334424
77	79. 37. 45	0. 229142	114	94. 53. 30	0. 339736
78	80. 9. 23	0. 232488	116	95. 31. 22	0. 344979
79	80. 40. 34	0. 235809	118	96. 8. 22	0. 350153
80	81. 11. 16	0. 239127	120	96. 44. 30	0. 355262
81	81. 41. 31	0. 242416	122	97. 19. 48	0. 360306
82	82. 11. 19	0. 245684	124	97. 54. 17	0. 365284
83	82. 40. 40	0. 248933	126	98. 28. 00	0. 370200
84	83. 9. 34	0. 252159	128	99. 00. 57	0. 375052
85	83. 38. 4	0. 255366	130	99. 33. 11	0. 379842
86	84. 6. 8	0. 258552	132	100. 4. 43	0. 384576
87	84. 33. 49	0. 261720	134	100. 35 45	0. 389252
88	85. 1. 5	0. 264865	136	101. 5. 48	0. 393868
89	85. 27. 58	0. 267989	138	101. 35. 22	0. 398428
90	85. 54. 27	0. 271092	140	102. 4. 19	0. 402930

Motu Cometarum in Orbe Parabolico.

Medius motus.	*Angulus à perihelio.*	*Logarithmus pro diſtantiâ à Sole.*	*Medius motus.*	*Angulus à perihelio.*	*Logarithmus pro diſtantiâ à Sole.*
o	gr. ′ ″		o	gr. ′ ″	
142	102.32.41	0. 407380	204	113.37.25	0. 523406
144	103.00.31	0. 411784	208	114. 9.52	0. 529705
146	103.27.47	0. 416132	212	114.41.23	0. 535886
148	103.54.31	0. 420430	216	115.12.02	0. 541958
150	104.20.43	0. 424676	220	115.41.51	0. 547922
152	104.46.22	0. 428866	224	116.10.52	0. 553782
154	105.11.33	0. 433012	228	116.39. 7	0. 559538
156	105.36.16	0. 437110	232	117. 6.38	0. 565199
158	106.00.32	0. 441164	236	117.33.27	0. 570762
160	106.24.23	0. 445178	240	117.59.35	0. 576233
162	106.47.47	0. 449144	244	118.25. 5	0. 581616
164	107.10.44	0. 453060	248	118.49.57	0. 586912
166	107.33.17	0. 456936	252	119.14.14	0. 592122
168	107.55.27	0. 460772	256	119.37.56	0. 597252
170	108.17.14	0. 464208	260	120. 1. 6	0. 602301
172	108.38.37	0. 468318	264	120.23.44	0. 607274
174	108.59.39	0. 472030	268	120.45.52	0. 612174
176	109.20.20	0. 475705	272	121. 7.30	0. 616998
178	109.40.40	0. 479340	276	121.28.39	0. 621750
180	110.00.40	0. 482937	280	121.49.22	0. 626438
182	110.20.20	0. 486498	284	122. 9.38	0. 631056
184	110.39.41	0. 490022	288	122.29.28	0. 635608
186	110.58.44	0. 493512	292	122.48.54	0. 640098
188	111.17.28	0. 496965	296	123. 7.57	0. 644525
190	111.35.55	0. 500384	300	123.26.36	0. 648893
192	111.54.05	0. 503769	310	124.11.40	0. 659559
194	112.11.58	0. 507121	320	124.54.36	0. 669880
196	112.29.34	0. 510441	330	125.35.34	0. 679876
198	112.46.55	0. 513729	340	126.14.44	0. 689568
200	113. 4.00	0. 516984	350	126.52.12	0. 698970

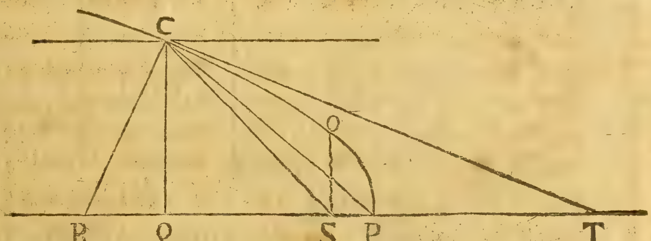
Tabula Generalis pro Supputando Motu Cometarum in Orbe Parabolico.

Medius motus.	Angulus à perihelio.	Logarithmus pro diſtantiâ à Sole.	Medius motus.	Angulus à perihelio.	Logarithmus pro diſtantiâ à Sole.
°	gr. ′ ″		°	gr. ′ ″	
360	127.28. 6	0.708104	820	141.49.24	0.970836
370	128. 2.33	0.716976	840	142.10.00	0.978397
380	128.35.38	0.725606	860	142.29.56	0.985771
390	129. 7.27	0.734006	880	142.49.10	0.992970
400	129.38. 4	0.742186	900	143. 7.48	1.000000
410	130. 7.34	0.750160	920	143.25.51	1.006871
420	130,36. 2	0.757930	940	143.43.21	1.013586
430	131. 3.30	0.765516	960	144.00.18	1.020155
440	131.30. 2	0.772918	980	144.16.46	1.026583
450	131.55.41	0.780148	1000	144.32.46	1.032876
460	132.20.30	0.787216	1500	149.26. 8	1.158188
470	132.44.32	9.794122	2000	152.26.15	1.246058
480	133. 7.50	0.800882	2500	154.32.20	1.313703
490	133.30.25	0.807494	3000	156. 7.27	1.368678
500	133.52.20	0.813969	3500	157.22.49	1.414974
520	134.34.18	0.826522	4000	158.24.36	1.454950
540	135.14. 0	0.838600	4500	159.16,36	1.490125
560	135.51.28	0.850187	5000	160. 1.12	1.521521
580	136.27. 6	0.861369	5500	160.40. 5	1.549874
600	137.00.57	0.872155	6000	161.14.24	1.575718
620	137.33.13	0.882575	6500	161.45.00	1.599460
640	138. 3.58	0.892649	7000	162.12.34	1.621417
660	138.33.21	0.902401	7500	162.37.34	1.641838
680	139. 1.29	0.911866	8000	163.00.23	1.660922
700	139.28.25	0.921012	8500	163.21.20	1.678834
720	139.54.16	0.929907	9000	163.40.42	1.695708
740	140.19. 5	0.938549	9500	163.58.38	1.711662
760	140.42.56	0.946951	10000	164.15.20	1.726784
780	141.05.55	0.955124	50000	170.52. 0	2.197960
800	141.28. 3	0.963082	100000	172.45.44	2.399655

Tabulæ

Tabulæ Generalis Conſtructio & Uſus.

Ut Planetæ in Orbibus Ellipticis, ita Cometæ in Parabolicis Solem in Foco communi ſitum ambiunt; ea lege ut Areæ æquales æqualibus temporibus deſcribantur. Quoniam vero Parabolæ omnes inter ſe ſimiles ſunt, ſi determinata aliqua pars Areæ datæ Parabolæ dividatur in partes quotlibet; in omnibus Parabolis fiet ſimilis diviſio ſub iiſdem angulis, atque diſtantiæ erunt proportionales: ideoque una noſtra Tabula pro Cometis omnibus ſufficiet. Calculi autem hujus Tabulæ hæc eſt ratio. In Schemate ſit S Sol, P O C orbita Cometæ, P Perihelion. O Locus ubi Cometa quadrante diſtat à Perihelio, C Locus quivis alius. Junge C P, C S. ac fiant S T, S R æquales ipſi C S; ac ductis rectis C R, C T (quarum hæc Curvæ Tangens eſt, illa perpendicularis) in axem P S R demitte normalem C Q. Jam data quâvis Areâ C O P S, oportet angulum C S P, & diſtantiam C S inquirere. Quoniam ob naturam Parabolæ recta R Q ubique æqualis eſt ſemilateri recto, ponatur latus rectum = 2, adeoque R Q = 1 : ac ſit recta C Q = z : erit itaque P Q = $\frac{1}{2}zz$, ac Segmentum parabolicum C O P = $\frac{1}{12}zzz$. Triangulum autem C S P erit = $\frac{1}{4}z$: adeoque Area mixtilinea C O P S erit $\frac{1}{12}z^3 + \frac{1}{4}z = a$, ac $z^3 + 3z = 12a$. Quare reſolutâ hâc æquatione Cubicâ, z ſive ordinatim applicata C Q innoteſcet. Proponatur jam Area O P S in partes centenas dividenda: hæc Area duodecima pars eſt quadrati lateris recti, adeoque 12 a æquantur Quadrato illo = 4 : Si itaque ſucceſſive extrahantur radices æquationum $z^3 + 3z = 0{,}04 : 0{,}08 : 0{,}12 : 0{,}16$ &c.



&c. habebuntur totidem z ſive ordinatim applicatæ CQ reſpective; ac diviſa erit area SOP in partes centenas. Eodemque modo ultra locum O continuandus eſt calculus. Radix autem hujus æquationis, cum RQ ſit $= 1$, Tangens eſt Tabularis anguli CRQ, ſive dimidii anguli CSP, adeoque angulos CSP datur. Ejuſdemque anguli CRQ ſecans RC, Media proportionalis eſt inter RQ ſive Unitatem & RT, quæ dupla eſt ipſius SC, ut ex Conicis notiſſimum eſt. Quod ſi SP ponatur 1, adeoque latus rectum $=4$ (ut in Tabulâ noſtrâ) ipſa RT erit diſtantia quæſita; duplum ſcilicet ipſius SC in priore Parabolâ. Ad hunc modum itaque præcedentem Tabulam elaboravi repræſentandis omnium Cometarum motibus inſervientem: hactenus enim nullus ex obſervatis Parabolæ leges reſpuit.

Reſtat jam præcepta Calculi tradere, modumque ſupputandi locum Cometæ viſum ex his Numeris exhibere. Cometæ autem in Parabola moventis Velocitas ubique eſt ad velocitatem Planetæ gyrantis in Circulo circa Solem, ad eandem à Sole diſtantiam, ut $\sqrt{2}$ ad 1: ut conſtat *ex Principiis Phil. Nat. Math. Lib.* I. *Prop.* 16. *Corol.* 7. Si itaque Cometa in perihelio ad diſtantiam æqualem diſtantiæ Terræ à Sole ſupponatur, erit area diurna, quam deſcriberet Cometa, ad aream quam deſcribit Terra, ut $\sqrt{2}$ ad 1. ac proinde tempus annuum, ad tempus quo Cometa talis deſcriberet Quadrantem Orbitæ ſuæ à Perihelio ut 3. 14159 &c. (hoc eſt ut area circuli) ad $\sqrt{\frac{8}{9}}$. Cometa igitur deſcriberet Quadrantem illum diebus 109. 14^{h}. $46'$. adeoque areâ illâ Parabolicâ areæ POS analogâ in centum particulas diſtributâ, ſingulis diebus competunt particulæ 0,912280. Cujus Logarithmus nempe 9,960128 in perpetuum uſum ſervandus eſt. Tempora autem, quibus Cometa in diſtantia majore vel minore Quadrantes ſimiles deſcriberet, ſunt ut Revolutiones in Circulis; hoc eſt in ſeſquiplicata ratione diſtantiarum: adeoque areæ diurnæ in partibus centeſimis Quadrantis æſtimatæ (quas medii Motus menſuras, inſtar Graduum, ponimus) ſunt in ſingulis in ſubſeſquialtera ratione diſtantiæ Periheliæ à Sole.

His neceſſario præmiſſis proponatur alicujus è Cometis noſtris Locum viſum ad datum tempus ſupputare. Primum itaque Solis Locus ab Æquinoctio in promptu ſit, ejuſdemque diſtantiæ à Terrà Logarithmus. 2°. Capiatur intervallum Temporis inter Tempus Perihelii & Tempus datum, in diebus partibuſque diei decimalibus. Hujus numeri Logarithmo addatur Logarithmus conſtans 9,960128 ac complementum Arithmeticum ſeſquialterius Logarithmi diſtantiæ Periheliæ à Sole: ſumma Logarithmus erit Motûs medii in prima Columna Tabulæ Generalis quærendi. 3°. Cum motu medio capiatur in Tabulâ correſpondens angulus à Perihelio, & Logarithmus pro diſtantiâ à Sole: ac in Cometis Directis adde, in Retrogradis ſubduc, ſi fuerit Tempus poſt Perihelium; vel in Directis ſubduc & in Retrogradis adde, ſi fuerit ante Perihelium, angulum ſic inventum á loco vel ad locum Perihelii. Et habebitur Locus Cometæ in orbitâ propriâ: Et ad Logarithmum pro Diſtantiâ ibidem inventum addatur logarithmus diſtantiæ Periheliæ, ſumma erit Logarithmus diſtantiæ veræ Cometæ à Sole. 4°. Cum Loco Cometæ in Orbitâ, dato Loco Nodi, capiatur diſtantia Cometæ à Nodo: ac datâ Inclinatione plani, dabuntur, Notiſſimis Trigonometriæ præceptis, Locus Cometæ ad Eclipticam reductus, cum Inclinatione ſive Latitudine Heliocentricâ, ac Diſtantiæ Curtatæ Logarithmus. 5°. Ex his datis, iiſdem omnino regulis quibus loca Planetarum, ex dato Loco & Diſtantiâ Solis; obtinebitur Locus Viſus ſeu Geocentricus cum Latitudine viſâ. Id quod exemplo uno vel altero operæ pretium erit illuſtrare.

Exemp. I. Quæritur Locus Cometæ Anni $166\frac{4}{5}$ *Martii* $1^{o}.7^{h}.00'$. P. M. *Londini.* Hoc eſt $96^{d}.19^{h}.8'$. poſt Perihelion ejus *Novemb.* $24^{o}.11^{h},52'$. Celebratum.

Log diſt Perihel.	0, 011044	*Perihel.* ♌	10. 41. 25	*Log. pro diſt.*	0. 255369
Log. Seſquialt.	0 016566	*Ang. Correſp.*	83. 38. 05---	*Log. Perihel.*	0. 011044
Comp. Arith.	9. 983434	*Comet. in Orb.* ♉	17. 3. 20	*Co-ſin. Incl.*	9. 990754
	9. 960128	☊ ♊	21. 14. 00	*Log. diſt. Curt.*	0. 257167
Log. Temp.	1. 985862	*Com. à Nodo*	34. 10. 40	*Log diſt.* ☉	9 997918
Log. Med. Mot.	1. 929424	*Red. ad Eclip.*	32. 19. 05	☉ ♓	21. 44. 45
Medius Motus	85. 001	*Com. Helioc.* ♉	18. 54. 55	*Com. Viſus* ♈	29. 18. 30.
		Incl. Bor.	11. 46. 50.	*Lat. Viſa*	8. 36. 15. *Bor.*

Exemp. II. Quæritur Locus Cometæ Anni 1683 *Julii* $23^{o}.13^{h}.35'$. P. M. *Londini.* Vel $13^{h}.40'$. T. æquat. hoc eſt $21^{d}.10^{h},50'$. poſt Perihelion.

Log diſt. Perihel.	9. 748343	*Perihel.* ♊	25. 29. 30	*Log. pro diſt.*	0. 111336
Log. Seſquialt.	9. 622514	*Ang. Correſp.*	56. 47. 20	*Log. Perihel.*	9. 748343
Comp. Arith.	0. 377486	*Comet. in Orb.* ♈	28. 42. 10	*Co-ſin. Incl.*	9. 913187
	9. 960128	☋ ♓	23. 23. 00	*Log. diſt. Curt.*	9. 772866
Log. Temp.	1. 310723	*Com. à* ☋	35. 19. 10	*Log. diſt.* ☉	0. 006104
Log. Med. Mot.	1. 648337	*Red. ad Eclip.*	4. 48. 30	☉ *Locus* ♌	10. 41. 25
Medius Motus.	44. 498	*Com. Helioc.* ♓	28. 11. 30	*Com. Viſus* ♋	5. 11. 50
		Incl. Bor.	35. 2. 00	*Lat. Bor.*	28. 52. 00

Momento autem primi Exempli, *Londini* obſervatum eſt Cometam applicari ad Stellam ſecundam *Arietis*; ita ut novem minutis illâ borealior repertus ſit, ac tribus minutis orientalior: Obſervante D^no^ *Roberto Hookio.* In ſecundo autem Exemplo ipſe, in viciniâ *Londini*, inſtrumentis quibus olim Stellas Auſtrales obſervaveram, Cometæ locum deprehendi ♋. $5^{o}.11'.\frac{1}{2}$, cum Latitudine Boreali, $28^{o}.52'$, conſentiente ad amuſſim obſervatione *Grenovicenſi* eodem pene momento factâ.

Cometa autem Anni 1680, qui pene Solem attigit, (non enim triente ſemidiametri corporis Solaris à ſuperficie ejus diſtabat in Perihelio) cum Latus rectum exiguum admodum ſit, Tabulâ Generali haud coerceri potuit, ob immanem Motus medii velocitatem: præſtat itaque in hoc, poſtquam inventus fuerit Motus medius, ex eodem, ope præcedentis æquationis $zzz + 3z = \frac{4}{100}$ *Mot. med.* Tangentem dimidii anguli à Perihelio elicere, una cum Logarithmo pro diſtantia à Sole. Quibus datis iiſdem omnino regulis ac in cæteris procedendum eſt.

Ad hunc itaque modum Aſtronomico Lectori examinare licet numeros à me poſitos, quos ſummâ curâ ex obſervationibus quæ ſuppetebant exantlavi; neque enim, antequam probe ad incudem redacti fuerint, ac multorum annorum ſtudio quantum fieri poſſit politi, in publicum prodeunt. Hoc autem ſpecimen Aſtronomiæ Cometicæ, futuri operis Prodromum, editum eſſe volui; ne forte ſuperveniente fato perirent lucubrationes noſtræ, ob Calculi difficultatem non cuivis homini denuo ſuſcipiendæ. Monendus autem eſt Lector, quinque priores ordine Cometas, quorum tertius & quartus eſt à *Petro Apiano* obſervatus, quintus vero á *Paulo Fabricio*, uti & decimus à *Mæſtlino* (ni fallor) anno 1596 conſpectus, non eundem certitudinis gradum cum reliquis præ ſe ferre. Neque enim debitis organis nec curâ ad hoc requiſitâ obſervationes ipſæ peractæ ſunt; adeoque inter ſe diſſidentes nullo modo cum computo regulari conciliari poſſunt. Cometam Anni 1684 unus vidit *Blanchinus* obſervator *Romanus*: ultimum vero Anni ſc. 1698 *Pariſienſes* ſoli conſpexerunt, ejuſque curſum inſolito modo deſignarunt. Obſcurus hic admodum, etiamſi velox ac terris ſatis vicinus, noſtros ſane oculos alioquin non incurioſos effugit. Inſignes autem duos hac noſtra ætate Cometas, alterum Anno 1689 Menſe *Novembri* ortum, alterum Menſe *Februario* Anni 1702, Catalogo ſubjungere non licuit, propter defectum obſervationum. Etenim verſus mundi plagas Auſtrales curſum dirigentes, ac in *Europâ* vix conſpicui, contemplatores non habuere negotio pares. Quod ſi forſan ex partibus *Indicis* advectæ fuerint accuratæ obſervationum ſeries ad hoc neceſſariæ; lubens calculum re-

repetere, horumque Orbitas, reliquorum ad modum, Numeris deſignandi laborem ſuſcipere non gravabor.

Anguſtiâ autem paginæ 1886, factum eſt, ut omiſſa ſit neceſſaria illa Columella quæ oſtendat an directe vel retrograde moti fuerint Cometæ. Sciat itaq; Aſtronomus undecim e noſtris Cometis directo curſu ſecundum ſeriem ſignorum proceſſiſſe, nempe illos annorum 1532, 1556, 1580, 1585, 1618, 1652, 1661, 1672, 1680, 1684 & 1686. Reliquos vero tredecim motu retrogrado contra ſeriem ſignorum curſum tenuiſſe. Quibus perpenſis, ac collatis inter ſe cæteris horum Cometarum motuum Elementis, videre eſt, nullo ordine diſpoſitos eſſe Orbitas; neque ipſos, Planetarum more, Zodiaco comprehendi poſſe, quaquaverſum tam Retrograde quam directe indifferenter latos; unde manifeſtum eſt eos motu vorticali nullo modo circumagi. Quinetiam diſtantiæ Periheliæ nunc majores nunc minores reperiuntur; unde pronum eſt ſuſpicari etiam multo plures eſſe Cometas, qui in partibus à Sole remotioribus, obſcuri caudaque deſtituti, adeoque nobis inconſpicui, præterlabi poſſunt.

Hactenus Cometarum Orbes conſideravimus ut perfectè Parabolicos; quo ſuppoſito conſequeretur Cometas, vi Centripeta verſus Solem impulſos, à ſpatiis infinite diſtantibus deſcendere, caſuque ſuo velocitatem tantam acquirere; ut iterum in ſpatia Mundi remotiſſima ſeſe abdere poſſint, perpetuo niſu ſurſum tendentes, ac ad Solem nunquam reverſuri. Cum autem ſatis frequentes ſint Cometarum adventus; ac eorum nullus reperiatur motu ferri Hyperbolico, ſeu velociore quam cadendo ad Solem acquirere debeat, credibile eſt potius in Orbibus valde Excentricis revolvi eos circa Solem, ac poſt longiſſimas periodos reverti: Sic enim Numerus eorum præfinitus eſſet, ac fortaſſe non uſque adeo magnus. Spatia autem inter Solem Fixaſque tanta ſunt, ut Cometæ revolventi cum Periodo quantumvis longa ſatis loci ſit. Latus autem rectum Ellipſis eſt ad Latus rectum Parabolæ eandem Periheliam diſtantiam habentis,

tis, ut diſtantia Aphelia in Ellipſi eſt ad Axem totum Ellipſis; Velocitates autem ſunt in dimidiata ratione eorundem: quapropter in Orbibus valde Excentricis ratio hæc accedit proxime ad rationem æqualitatis. Tantilla autem differentia, quæ intercedit ratione majoris in Parabola velocitatis, facillime in ſitu Orbis determinando compenſatur. Hujus itaque Tabulæ Elementorum Motuum uſus præcipuus eſt, atque etiam propter quem illam conſtruere operæ pretium duxi, ut, ſi quando novus Cometa emerſerit, poſſimus collatis elementis dignoſcere an poterit eſſe aliquis ex antiquis, necne; ac proinde Periodum Orbitæque Axem determinare, reditumque prædicere. Ac ſane multa me ſuadent ut credam Cometam anni 1531 ab *Apiano* obſervatum, eundem fuiſſe cum illo qui anno 1607 deſcriptus eſt à *Keplero* & *Longomontano*, quemque ipſe iterum reverſum vidi ac obſervavi anno 1682. Quadrant Elementa omnia, ac ſola inæqualitas periodorum adverſari videtur: hæc autem tanta non eſt ut cauſis Phyſicis non poſſit attribui. *Saturni* enim motus à cæteris, præſertim *Jove*, ita interturbatur, ut per aliquot dies integros incertum ſit hujus Planetæ tempus Periodicum. Quanto magis talibus erroribus obnoxius erit Cometa, qui quatuor pene vicibus altius excurrit *Saturno*, cujuſque velocitas, vel tantillum aucta, Orbem ab Elliptico in Parabolicum poſſit immutare? Confirmatur etiam eundem eſſe potuiſſe ex eo, quod anni 1456 æſtate, conſpectus fuerit Cometa eodem pene modo inter Solem & Terram tranſiens retrogradè: quem, licet à nemine obſervatus fuerit Aſtronomicè, ex periodo modoque tranſitus non diverſum a prædictis extitiſſe conjicio. Unde auſim ejuſdem reditum fidenter prædicere, anno ſcil. 1758. Quod ſi hoc evenerit, nulla amplius erit dubitandi cauſa, quin redire debeant cæteri. Habebunt ergo Aſtronomi in hac arenâ quo ſe exerceant per multa Secula, priuſquam tot tantorumque Corporum circa commune centrum Solis revolventium numerus cognoſcatur, ac motuum ſymptomata certis regulis coerceantur. Crediderim equidem

Cometam etiam anni 1532, eundem fuiſſe cum illo, qui ab *Hevelio* obſervabatur ineunte anno 1661: ſed obſervationes *Apiani*, quas ſolas de primo habemus, nimis rudes ſunt, nec quicquam certi in re tam ſubtili ex iiſdem elici poteſt. Juſto volumine hæc omnia exequi mihi animus eſt, nec Aſtronomiæ promovendæ hac in re deero, ſi Deo O.M. viſum fuerit vitam facultateſque prorogare. Interim quicunq; modum Conſtruendi Cometarum Orbes per tres obſervationes accurate habitas addiſcere cupit, ſub finem libri de Syſtemate Mundi, ſive tertii *Philoſophiæ Nat. princip. Math.* magni ipſius Inventoris methodum inveniet: Quam poſtea Digniſſimus Collega meus *D. Gregorius*, Lib. V. pereruditæ Aſtronomiæ ſuæ Phyſicæ & Geometricæ plene & luculenter illuſtravit.

Unicum autem non abs re erit nec injucundum, hic loci Lectorem monere Aſtronomum; nempe quod nonnulli ex his Cometis Nodos ſuos habeant adeo Orbi Terræ annuo vicinos, ut ſi forte acciderit, tempore reditus Cometæ, *Terram* occupare Loca in orbe ſuo Nodo proxima, dum Cometa incredibili cum Velocitate præterierit, Parallaxin etiam habiturus ſit valde obſervabilem, quæque fuerit ad Solis parallaxin in ratione datâ. Unde occaſione talium tranſituum oblata erit anſa, rara quidem ſed optima, determinandi Solis a *Terra* diſtantiam; quam hactenus non niſi mediante parallaxi *Martis* Acronychii, vel *Veneris* perigææ, triplo quidem ſolari majore, ſed quæ vix ullis inſtrumentis ſentiatur, laxe admodum concludere licuit. Quem Cometarum uſum ſuggeſſit Clariſſimus Geometra D^s^ *Nic. Facio.* Cometa etenim anni 1472 parallaxin habuit pluſquam vigeſies Solari majorem. Ac ſi Cometa anni 1618 appuliſſet, juxta medium Menſis *Martii*, ad Nodum ejus Deſcendentem; vel ſi Cometa anni 1684 paulo citius ad Nodum Aſcendentem perveniſſet, profecto Terris admodum propinqui etiam adhuc magis notabiles habuiſſent parallaxes: Inter omnes vero nullus propiore appulſu Terris minatus eſt quam ille anni 1680: Hic inito Calculo non amplius ad Boream

diſtabat ab Orbe noſtro annuo, quam ſemidiametro ſolari (ſive Radio Lunaris Orbitæ, uti exiſtimo) idque Novemb. 11^{o}. 1^{h}. $6'$. P.M. Quo tempore, ſi Terræ quoad Longitudinem conjunctus fuiſſet, parallaxis ſane Lunari æqualis in Cometæ motu obſervari potuiſſet. Hæc Aſtronomis dicta ſunto. Quæ vero ab hujuſmodi allapſu, vel contactu vel denique colliſione Corporum cœleſtium (quæ quidem omnino non impoſſibilis eſt) conſequi debeant, rerum Phyſicarum ſtudioſis diſcutienda relinquo:

V. *Part of two Letters from the Reverend Dr* Rich. Wroe, *Warden of* Mancheſter *Colledge, to Dr* Hans Sloane, *S. R. S. concerning Horn-like Excreſcences growing on the Fingers, &c.*

Mancheſter, Aug. 26. 1704.

Sir,

THere lives at *Bolton* (8 miles from this Town) one *Nathaniel Hulme*, aged about 17, who had the Small Pox about 8 years of age: Soon after which he had a great Itch, almoſt to the degree of a Leproſie, with which his Finger-nails and Thumb-nails began to grow thick, and by degrees hardned into Horns; which grew in 7 or 8 months to the length of an Inch, and ſome almoſt 2 Inches, and ſome much longer. It began in the Fore-finger of his Left Hand, and ſo to all the reſt of that Hand, which had as many Horns as Fingers, and Thumb. All which Horns about the end of 12 months fell off by degrees; that which grew firſt falling off firſt, without any pain, unleſs when cut off, as they were at firſt, there ap-

appearing great quicks (as they call them) or Roots under the Nails. By degrees they came on the Thumb, and then on the Fingers of the Right Hand; which grew to the ſame length in about a years time, and then fell off, he having ſhed them 5 or 6 ſeveral times. One of the Horns, that grew on the Ring Finger of the Left Hand, was a quarter long. They are now at preſent all come off his Left Hand, but growing again: That on his Little Finger is 2 Inches long. I have now by me one or two of them.

This account I took of him above two years ſince, in 1702; and have ſeen him frequently ſince, and lately, and the Horns ſtill grow, and fall off, as uſual.

Ric. Wroe.

Octob. 2. 1704.

Sir,

I Have, according to your requeſt, ſent you two of the Horns which grew upon the Boys Fingers, I writ to you of. He has at preſent all the Fingers of both Hands armed with ſuch like, and ſome as long as theſe I ſend. He has on every Toe alſo, but keeps them cut, that he may be able to wear Shoes. I ſaw him a few days ſince, and think he cannot live long, being miſerably overſpread with his Leproſie.

Ric. Wroe.

One of the Horns above-mentioned is now in the Repoſitory of the Royal Society.

VI. *An*

VI. *An Extract of a Letter from Mr* Ralph Thoresby, *F. R. S. to Dr* Hans Sloane, *S. R. S. concerning ſome* Swediſh *Coyns ; and a Calculation for the finding of* Eaſter.

Honour'd Sir,

I Have a *Swediſh Coyn,* or rather Square Copper Plate, 9 inches broad, and 9 and a half long, which is much like the *Roman Æs grave*, and was currant there ſo lately as *An.* 1679. (tho now they are not to be met with) It has at each corner the Impreſſion of a Crown, under which is the Year, and round it this Inſcription, CAROLUS XI. D. G. SVE. GOT. WAN. REX. and in the middle of the Plate in a Circle 2 DALER. SÖIH. Mjt. The other ſide of the Plate is without any Inſcription.

The Treatiſe you mentioned concerning a Coyn of mine, inſerted in the late Edition of the *Britannia*, is, I preſume, upon the *Runic* Annulet of the God *Thor*, of which I have the Learned Readings of two very great Men, my Lord Biſhop of *Carliſle* and Dr *Hicks* : And as the Antient Heathens inſcribed the Name and Effigies of their reputed Deity upon that Piece, ſo ſeveral of the Modern Chriſtian Princes of thoſe Northern Countrys, have inſcribed the *Nomen Tetragrammaton* of our Almighty *Jehovah* on ſome of their Moneys: I have *een Svenska marc* of *Charles* the 9th with it, ſurrounded with rays of Glory in the midſt of the *Area* on the Reverſe, and a Mark, ½ Mark, and a 2 Mark piece all of the famous *Guſtavus Adolphus*, with the like Characters above the Kings Head.

The Learned and Ingenious *Richard Thornton* Eſq; upon reading Dr *Wallis*'s Letter to Sir *John Blencowe*, one of his then Majeſty's Juſtices of the Court of *Common*

Pleas. concerning the obſervation of *Eaſter*, regiſtred in the *Phil. Tranſ.* 240. made this Calculation.

Rightly to underſtand the Rule in our Common-Prayer Books for finding *Eaſter.* Note,

1. That the 21ſt of *March*, in all but Leap-years, and in Leap-years the 20th of *March*, was, at the time of the Council of *Nice*, when this Rule was made, the Vernal Equinox: Conſequently,
2. That the 20th of *March* in Leap-years is the ſame as the 21ſt of *March* in common years.
3. That the Full Moon meant in this Rule is not to be found in our Almanacks, but by the Calendar of our Common Prayer Books, where, in the firſt Column the Golden Number of every year is placed over againſt the day of the New Moon in every month of the year.
4. That the fourteenth day, including the firſt day of the Moon, is the Full Moon, and not the fifteenth, as Dr *Wallis* would have it in his Letter.

VII. *An Account of an Experiment made at a Meeting of the Royal Society at* Greſham College, *upon the Propagation of Sound in Condenſed Air. Together with a Repetition of the ſame in the open Field, by Mr* F. Hauksbee.

A Bell being included in a Braſs Recipient, and plac'd at one end of a Room, about 50 yards in length: At the other end of which ſtood ſome Gentlemen to obſerve the ſound; which before any Air was intruded, the Bell upon ſhaking was heard at that diſtance, tho not without diligent attention. Upon the Intruſion of one Atmoſphere (begging leave to call it ſo) the Bell being ſhaken as before, the ſound was very ſenſibly augmented;

two Atmoſpheres being Impell'd, and the Bell made to Ring, a notable Improvement of the Sound was then manifeſt. But upon the Intruſion of the 3d, 4th and 5th Atmoſpheres, the Bell being made to ſtrike, the Sound ſeem'd not to be Propagated proportionably to the firſt and ſecond; which might happen by means of ſome Eſcapes of Air, or, which is much to the ſame purpoſe, the Valve, which ſhould have hindred the Return of the Injected Air, did not hold ſo tight as I expected, or as it ought; but that ſome of the Intruded Air would repaſs into the *Syphon*, by which means the Quantities ſuppos'd Injected were deficient. Another reaſon the latter Atmoſpheres did not propagate the Sound as the two firſt, is this, altho 25 Compreſſions of the *Syphon* are equal to the Natural Content of the Recipient, yet when the Air becomes pretty ſtrongly Condens'd, as by the Intruſion of 4 or 5 Atmoſpheres, the remaining Air at every ſtroke which will lye between the Bottom of the *Embolus* and the *Valve* (altho but little) is at the ſame Denſity at the ſame time as the Air in the Recipient; which, upon drawing up the forces, will extend it ſelf to ſupply ſuch a ſpace of the Cylinder as ſo much common Air; and is ſo much ſhort of what ſhould be Injected at every ſtroke, 25 of which become equal to the Natural Content of the Receiver. Hence the Deficiencies of the Real Atmoſpheres or Quantities, by a certain number of Strokes may be very conſiderable, and to account for them moſt difficult; and ſo I muſt leave them for the preſent, begging pardon for this digreſſion. I conclude, Notwithſtanding the Deficiencies are not known, yet at the end of the 5 (tho Imperfect) Atmoſpheres, the Bell being ſhaken as at firſt, it was the Opinion of a Gentleman then 50 yards diſtant, that the Sound ſeem'd to be almoſt as and as ſenſible as when it came to be made and expos'd in the open Air.

June the 9th, about 5 in the morning I repeated this Experiment in an open Field, known by the name of the *White Conduit*, ſituate on the Weſt of *Iſlington*, with much the like ſucceſs as the former. Upon ſhaking the Bell before any Air was intruded, it was but juſt audible at 30 yards diſtance. Upon the Injection of one Atmoſphere (begging leave as before to call it ſo) it became then as audible at 60 yards, as it was before at 30. A ſecond being intruded, the Bell upon ſhaking might then be heard at 90 yards diſtance. But after that, tho near 100 ſtrokes of the forces were repeated, yet could it hardly be heard 20 yards farther. Which I attribute in a great meaſure to the Reaſons before given. The Morning was very Miſty, which caus'd a great Dew upon the Graſs. Little or no Wind ſtirring. And the ſilence requiſite in making ſuch an Experiment nicely, at laſt began to be interrupted by the ſounds of the five a Clock Bells, and other Noiſes which joyn'd in Chorus with them from the City, contributing in ſome meaſure to the unſucceſsfulneſs of the latter part of the Experiment: Which ſtill I hope to proſecute farther, not deſpairing of finding ſuch a Gage as will ſhow the Certainty of the Quantities injected, without any danger or hazard in the Attempt.

VIII. *An Experiment made at a Meeting of the Royal Society, touching the Diminution of Sound in Air rarefy'd. By Mr* Fr. Hauksbee.

A Bell being included under a Receiver, which being ſhaken to make the Clapper ſtrike, it was very obſervable that the Interpoſition of the Glaſs betwixt the Bell and the Ear, was a great obſtruction to its Sound, notwithſtanding it was audible at ſome good diſtance from it: But gradually withdrawing the Air, and making ſeveral Stops to ſhake the Bell at different Degrees of Rarefaction, the Diminution of the Sound at every Stop was very diſtinguiſhable. Till at laſt, when the Receiver was well exhauſted of Air, the remains of Sound was then ſo little, that the beſt Ears could but juſt diſtinguiſh it: It appearing to them like a ſmall ſhrill Sound as at a great remoteneſs. Upon ſuffering the Air to re enter (which was not done all at once, but by turns) 'twas eaſie to perceive the increaſe of Sound at the different times the Bell was made to ring: The Recipient being again repleat with Air, the Sound then ſeem'd ſomething more clear and audible than it did upon its firſt incluſion.

LONDON,
Printed for *Sam. Smith* and *Benj. Walford*, Printers to the Royal Society,
at the *Princes Arms* in *St Paul*'s Church-yard, 1705.

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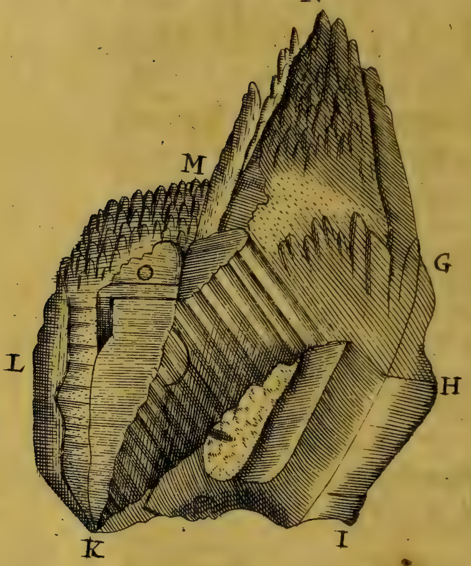

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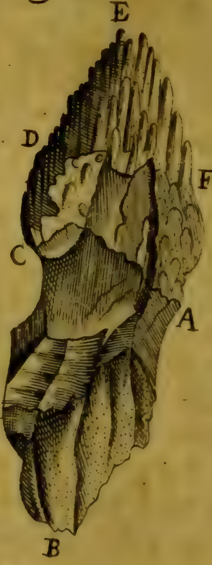

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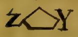

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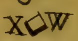

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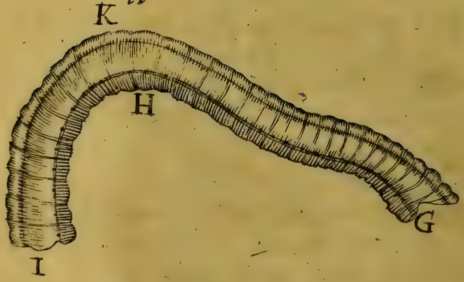

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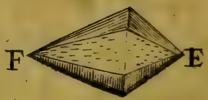

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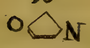

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PHILOSOPHICAL TRANSACTIONS.

For the Month of April, 1705.

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I. *A Letter from Mr* Anthony van Leeuwenhoek, *F. R. S. concerning the Figures of the Salts of Cryſtal.*

ABout the end of laſt *March* the *Heer Peter Valkenier* made me a Viſit again, and brought with him ſeveral Cryſtals that were ſtill joyned to ſome pieces of the Rock, and were very remarkable; among the reſt, the ſaid Gentleman had one about as big as my Fiſt, which look'd like ſeveral ſmall Flint-ſtones joyn'd together; they ſeem'd to be united by very Tranſparent Particles, which one might call Wild Cryſtal: And when I view'd the ſo nam'd Cryſtal Particles, of which the largeſt prominent Points ſeem'd no bigger thro the Microſcope than a large Grain of Sand, many of 'em appear'd to me to be Hexangular, like the Mountain Cryſtal.

The ſaid Gentleman told me farther, that in *Switzerland* there were found ſome of the higheſt Mountains, where the great and ſmall Stones were almoſt mix'd or united with the wild Cryſtal, which Mountains are therefore call'd by the Inhabitants *Nagelfelſen*, which is as much as to ſay, the Nail Mountains or Rocks, by reaſon of the great number of prominent points in the ſame.

He very obligingly preſs'd me to take ſome of theſe Stones, ſo joyned as is above mentioned, in order to make my obſervations concerning 'em, which I did accordingly, and with a Key ſtruck off 4 or 5 ſmall Flint Stones from the great piece; in doing which, ſeveral of the ſo nam'd wild Cryſtal Particles came off together.

I

I placed the ſaid Cryſtal Particles before a Microſcope, and obſerved that each of them was almoſt of a uniform figure, tho moſt of them run into an hexangular point of ſeveral ſizes ; in the breaking them from one another the ſides aſſumed particular figures, which looked as if they were compoſed of nothing but long Particles, all of them as bright and tranſparent as any Cryſtal, ſave only in thoſe parts where they were joyned to the Stones. The Cryſtal Particles lay very thick upon one another, and they were ſo ſmall that 100 and more were not equal to our Cryſtal Particles ; among others, I obſerved ſome Cryſtal Particles no bigger than a courſe grain of Sand, the which were compoſed of 100 other ſmaller Particles, all very tranſparent, and appearing thro the Glaſs like a little Mountain of Cryſtal, which was a very agreeable ſpectacle.

I ſaw likewiſe ſeveral Cryſtal Particles, which, inſtead of ending in one hexangular point like others, conſiſted of ſeveral ſharp ones, ſome of which were very different both in length and thickneſs from the reſt, which confirm'd my opinion, that they were coagulated out of long Particles.

I obſerved, that where the little Flint Stones had not lain very cloſe to one another, the void ſpace, as it appeared to the naked eye, had alſo been filled with the ſaid Cryſtal Matter ; but when I came to view them more narrowly, I could perceive that thoſe Cryſtal parts were indeed united to the little Flint Stones, but that there were ſeveral ſmall Cavities between them ; from whence I concluded, that the Flint Stones lying ſo upon one another, as we now find 'em, a fluid Cryſtalline Matter, out of which all the Cryſtals were coagulated, had inſinuated it ſelf between thoſe Flint Stones ; and where thoſe Stones were not ſo cloſely joyned, there did not happen to be enough of that Cryſtalline Matter to fill up the vacant ſpace.

I have thought fit to repreſent two of the ſo named Cryſtal Particles, (as they appeared to me thro my Microſcope.)

whoſe ſuperficies ended in ſuch points as I have before mention'd.

Fig. 1. A B C D E F ſhews you one of the ſaid Cryſtal Particles, wherein you may obſerve at A B C, and partly alſo between D F how it had been joyn'd, and how alſo it had been broken off from other Cryſtal Particles; between D E F is that part from whence proceeds ſeveral prominent points, which the Painter has deſcrib'd to the beſt of his power.

Fig. 2. G H I K L M N Repreſents a larger Particle of Cryſtal which had been joyn'd to another Particle lying by it; as in G H I K O is ſhown that part that had not been united, and in which, as far as it is poſſible, the ſeveral prominent Points are deſcrib'd by L M N G O. In handling theſe forementioned Cryſtal Particles, I found that they were ſeparated from one another with very little trouble; to make a further proof of the ſoftneſs thereof, I plac'd a Particle of it no bigger than a grain of Sand upon a Plate, and then preſſing it with my Thumb Nail, it burſt into a thouſand ſmall pieces, which ſeem'd the ſtranger to me, becauſe we know generally how hard the Mountain Cryſtal is.

From this Experiment, I imagin'd, that what we call wild Cryſtal is moſtly Salt, if perhaps it be not all ſo.

To make a further tryal thereof, I took a piece of the ſaid Cryſtal about the bigneſs of a Pea, which I broke off from a Flint Stone, and laid it upon a Silver-Smith's Wood Coal, and put it into a glowing heat, and then threw it into ſome clean Rain-Water, whereby it was immediately diſſolv'd into white Powder; but viewing the ſame with my Microſcope, I ſaw that there remain'd ſome Particles ſtill as big as a grain of Sand.

The ſmall quantity of Water in which the Cryſtal lay, that was no more than could be contain'd in a little Thimble, having ſtood about a quarter of an hour, I obſerv'd that the ſuperficies of it was cover'd with a thin Scum, of which taking a ſmall part, (as I did again when the ſaid

Scum was grown thicker, after the ſpace of 3 or 4 hours) and placing the ſame before a Microſcope, I ſaw, that beſides ſeveral ſmall Particles, of which for the moſt part the Scum was compos'd, there lay an unſpeakable Number of Salt Particles, and thoſe of very different figures, inſomuch, that they are not to be deſcribed: Some of 'em were Long, Quadrangular and Hexangular Figures, appearing all of 'em to be ſolid Cubical Bodies; their longeſt ſides were parallel to one another; and when I view'd theſe Coagulated Salts, ſome of which lay upon the Superficies of the Water, as others were ſunk to the bottom, I obſerv'd that they were not only grown larger, but that each of 'em was encompaſs'd with ſeveral Circles or Circumferences.

Moreover, where the Water was exhaled, there lay ſuch an unſpeakable number of ſmall Salt Particles, that they did in a manner eſcape the ſight, inſomuch, that in ſome of 'em it was impoſſible to diſcover any figure; and of ſome that were yet ſmaller, there was nothing more to be ſeen in them than an exceeding ſlenderneſs and length; juſt as if one ſaw with the naked Eye very ſmall Particles or Threads of Wool: From which Obſervation I ſuppoſed, that in caſe I had put the Water a little thicker together, inſtead of ſpreading it upon the Glaſs as thin as it was poſſible, the Coagulation of the Salt Particles would have been thicker and larger: I concluded too, that moſt of thoſe very ſlender and long Particles were of the ſame figure as the larger. In ſhort, the Salt Particles were ſo exceeding numerous, that it is inconcievable by any body but ſuch as have had a ſight of 'em.

When a great many of thoſe very Tranſparent, and as it were Cryſtalline Salt Particles were become dry, their Tranſparency or Brightneſs did in a manner vaniſh, and they were chang'd to Opake Bodies, in which one could not perceive the leaſt Tranſparency, but they appear'd to be a white Matter.

This

This Diſcovery made me imagine, that whereas one of theſe forementioned Particles, whilſt it had any moiſture about it, was always increaſing, by a Confluence or Coagulation of unſpeakably ſmall Salt Particles, all of 'em ſo firmly united to one another, that they ſeem'd to be ſo many Cryſtals; ſo when that ſame moiſture was wholly exhal'd, the Coagulated Particles were preſently ſeparated from each other; yet the Diſſolution was not ſo efficacious as to deprive them of the figure which they had, but only of their ſtrict Conjunction: So that inſtead of being one Tranſparent Body, they were turn'd into ſeveral Bodies, that did not admit the Light, but appear'd white to our Eyes. And I imagin'd likewiſe, that when the Water was exhal'd at laſt, thoſe very ſmall Salt Particles, whoſe figures, by reaſon of their ſmallneſs, had altogether eſcap'd my ſight, were not Coagulated upon the great Salt Particles, and ſo were depriv'd of their Tranſparency; whereas the Tranſparent Salt Particles that were more thinly Coagulated did preſerve their Tranſparency, but they were but very few.

After that the abovementioned Water had ſtood ſeveral days upon the ſo nam'd wild Cryſtal, which I had thrown into it glowing hot, I put a very ſmall part of it upon a clean Glaſs, and plac'd the Water ſo, that there came but very little Air to it, and then I could perceive but a very little Coagulation of the Salt Particles; but, placing the ſame Water in the Air, I ſaw that there were a great many Salt Particles coagulated. In ſhort, there was ſuch an inconceivable Number of exceeding ſmall Salt Particles in a little quantity of Water that lay within the compaſs of a Pea, that it is impoſſible to make any man believe it.

I took moreover, ſome of the Salt Particles that lay upon the Superficies of the Water, after that it had ſtood about eight days, and obſerv'd at the ſame time, that they were not only coagulated much larger together, with very neat and ſmooth ſides and ſuperficies, but alſo that they were grown much thicker, as well as broader and longer, having been coagulated with ſo many ſmaller Salts, that they appear'd to be ſolid Cubical Bodies of Cryſtal; but I could not diſcover, in a great number of thoſe Salts, any two Salt Particles that were like one another.

Now when I perceiv'd that the wild Cryſtal, after I had heated it glowing hot, had diſſolv'd it ſelf into ſuch inconceivable numbers of ſmall Particles in the Water, I took a ſmall Copper Porringer, the cavity of which made half a Globe; and having clean'd the ſame very well, I put into a little Water a little of the ſaid Cryſtal, and plac'd it over a Wood Coal, with ſo much heat, that it was boiling in the ſpace of a minute, and kept it there till the Water had almoſt evaporated; after which, I mixt the remainder with Rain Water, and put ſome of the ſame upon ſeveral clean Glaſſes, to ſee, whether the Water, by the above-mentioned boiling, was not alſo impregnated with Salt Particles.

This Water being moſtly exhaled, I diſcovered in it ſeveral Salt Particles, almoſt of the ſame figure as the former; but, foraſmuch as the Water in which the glowing wild Cryſtal was put, had been wholly exhaled; the laſt Glaſſes were altogether covered with a Vapour which moſtly ſurrounded the Salt Particles; the which Salt Particles I imagined to be very ſoft, and which were alſo cover'd with a very thin Membrane.

To ſatisfy my ſelf further concerning the laſt Obſervation, I heated the Glaſs upon which the laſt Salt Particles lay, till the Vapour or Moiſture was quite exhaled, and then I could perceive a great many ſmall Salts that I had not ſeen before, but nothing near ſo many as came out of the firſt Water; after the ſpace of about an hour, it being moiſt weather, I viewed the Glaſs again, and found the Wateriſh Vapour lying ſo thick about the Salt Particles, as if none of it had been exhal'd.

I have thought good to give you a Sample of ſome few of the Salt Particles that were coagulated in that Water, in which the glowing Cryſtal was quenched, that you may better conceive the Figures of them.

Fig. 3. Shows you between P and Q a little Figure of a Salt, in which ſuch a Salt Particle lay, that according to all appearance was at firſt coagulated, and afterwards arrived at that bigneſs when the Water was quite exhaled.

By Fig. 4. between R and S is another Salt Particle deſcribed, having likewiſe within it a Coagulated Salt Particle, which at R. has two right Angles, and at S. an acute one, both the long ſides thereof running Parallel, and at equal diſtance from each other; of theſe Figures there were a great many.

Fig. 5. T. U. ſhows you an Hexangular Figure, wherein alſo lay a ſmaller of the ſame ſhape, the which incloſed Figure was very thick.

By Fig. 6. between W. and X. is repreſented a Salt Particle, whoſe ſuperficies made an exact ſquare; Of theſe Figures I met with very few, eſpecially where the Water had lain thick.

Fig. 7. Y. Z. deſcribes a Figure, the like of which, I did diſcover an exceeding number, altho' the ſame were very thin.

Fig. 8. ſhows alſo between A. and B. another Salt Particle, of which there were an unſpeakable number coagulated in the Water.

Having made a great many Experiments in the laſt mentioned Water till it was quite exhaled, and having alſo poured new Water twice upon the ſo named wild Cryſtal, I ſaw with great ſurprize, that each time there was a Coagulation of new Salts upon the ſuperficies of the Water; but moſt of them ſo very ſmall, that they appeared thro the Microſcope no bigger than a Grain of Sand to the naked Eye, and yet I could perceive the Figures of them very clear, and the more, becauſe they were all of them very tranſparent ; and whereas a great many Salt Particles are ſo ſoft, that in moiſt Weather they are diſſolv'd into a Watry Vapour, theſe were ſo hard and ſo dry likewiſe, as if they had been the Salts of Chalk ; and if one ſhook the Glaſs in which they were, they came off from it, eſpecially thoſe Salt Particles that were pretty large.

After theſe Obſervations I took another View, by the help of a Microſcope, of ſeveral pieces of my Mountain or Rock Cryſtal, juſt as I had broke it off from the Stone, in which I had formerly diſcover'd, amongſt others, ſome ſuch figures as are deſcrib'd in Fig. 5. between T U ; and now obſerving again an Hexangular piece of Cryſtal which ended alſo in a point of the like ſhape, I diſcover'd in the ſame ſeveral pointed blue ſmall Cryſtals, as you ſee in Fig. 9. between C and D. They were of ſeveral ſizes, and ſome of them a finer blue than the reſt.

I alſo diſcover'd in another piece of Cryſtal much the like Figure, but none of them were blue, ſome of which were as tranſparent as Cryſtal, and the others again as dark as if they had been nothing but a blackiſh Earth ; ſome of them lay much deeper in the Cryſtal than the others.

I had one piece of Cryſtal, in which I counted above 30 little blue Figures, ſuch as are deſcrib'd by Fig. 9. and ſome of them ſo very ſmall, that they appear'd no larger thro a Microſcope than a grain of courſe of Sand to the naked Eye ; and as far as I could judge of 'em, they were moſt of them Hexangular ; but I obſerv'd, that ſome of them were not ſo perfect and regular as the reſt, one point of them being bigger than the others, as they are deſcrib'd in Fig. 10. between E F.

I ſaw alſo one little Figure lying, that was exactly of equal ſides, but the fore-ſides thereof ran obliquely, and the ſuperficies of the ſame did alſo conſiſt of an exact quadralateral Figure ; it was moreover as bright as Cryſtal, appearing juſt like one of thoſe Diamonds of the ordinary ſort, which we call thick Stones.

Is it not extreamly ſurprizing to ſee the abovemention'd Figures incorporated in ſuch a hard matter ? Some of them lying near the ſuperficies of the Cryſtal, and ſome of 'em much deeper.

I have a piece of Rock Cryſtal that is Hexangular, and ending in an Hexangular point; it is about a Finger thick, and an Inch long; upon one ſide of it one could diſcover with the naked Eye little cavities or holes, about the largeneſs of half a Nail, the which cavities ſeem'd, for the moſt part, to be fill'd with an Earthy matter; but when I plac'd the ſaid Cryſtal before my Microſcope, my opinion of it was, that while the ſaid Cryſtal was growing or coagulating, ſeveral ſmall Inſects running about upon it, were irretiated or impriſoned therein; the rather becauſe that ſome other Particles lay yet deeper in the Cryſtal, and ſo they were altogether ſhut up in the ſame. The Bodies of theſe Inſects or Worms were compoſed of very ſmall and ſlender Circles, or Ring-like parts, as I have obſerved frequently in ſuch *Animalcula*.

I placed the ſaid piece of Cryſtal before a Microſcope, and cauſed the Painter to draw a ſmall part of one of theſe ſeeming Inſects that lay pretty deep in the Chryſtal, as you may ſee in Fig. 11, G H I K.

I could ſee no further of this Part, becauſe the ends thereof, viz. G and I, were cover'd with other ſuch like Particles; and this was alſo the largeſt Body that I could diſcover amongſt them, for the other Particles were broke into much ſmaller bits and pieces. Amongſt all thoſe that I obſerved, there was but one Particle that ended in a point, and that I judged to be a part of the Tail, as I gueſſed that another had been a Head; I ſaw alſo two ſmall Particles that had been alike green, and ſo were ſeveral other little pieces of Inſects.

I had two pieces of Cryſtal, of which the ſmalleſt was above an inch thick and Hexangular, wherein I diſcover'd ſeven long Particles, the largeſt of which was no thicker than the Hair of a Mans Head; they were of a dark grey colour, and had at one end ſeveral thinner Particles, or little Fibres branching out; ſome others were much finer than the ſingle Hair, and ſome of them of exceeding fineneſs.

In another and thicker Cryſtal, I ſaw above five and twenty more ſuch long Particles; and notwithſtanding that I broke that Cryſtal into pieces, to diſcover of what Matter theſe Particles were compoſed, yet I could not ſucceed therein. I ſaw indeed that one of 'em had a ſort of a Cavity in it, and was round, another flat without any hollowneſs, and in another piece of the broken Cryſtal I could perceive a Triangular long Particle that was hollow; this laſt was very viſible, becauſe one end of it lay oppoſed to my ſight. I ſaw alſo another very plainly that was Triangular likewiſe, two ſides of which were a third part broader than the other; but I was not very ſure that it was hollow: I ſaw alſo another long Particle that was Quadralateral, of which the two oppoſite ſides were twice as broad as the other two; and foraſmuch, as I was well aſſured, that it could never have been any Hair or Particles of Wool, nor had I ever ſeen any Vegetable that had produc'd ſuch fine ſlender Parts, I could not come to any concluſion what for a ſubſtance it was, and much leſs how they could come into the Cryſtal, in which they lay acroſs or athwart one another.

I have obſerv'd before, that when I plac'd ſuch Rock Cryſtal over the Fire, it burſt into a great many pieces; from whence I inferr'd, that in the ſame there muſt be ſhut up either ſome Vapour, or elſe Particles of Salt, that occaſion'd its breaking into ſo many pieces; to diſcover which, I put into a little Glaſs ſeveral pieces of ſuch broken Cryſtal; and obſerv'd that by the Fire a very little Moiſture and Salt was drawn off from the ſame; but when I threw ſome of thoſe pieces of Cryſtal, as glowing hot as I could make them, into Water, I could not diſcover, as I had done in others, any Salt Particles Coagulated upon the Superficies of the Water.

However, I took ſome more pieces of Cryſtal, and plac'd 'em upon a Wood Coal, and the ſmall remainder thereof, which the Heat had not forc'd to fly away, I threw into ſome clean Rain Water; and tho I could diſcover no Salt Particles upon the ſuperficies thereof, yet I took ſeveral times ſome of the ſaid Water, and pour'd it upon the cleaneſt Glaſſes I could get; and after that it had ſtood ſome time both in moiſt and dry Weather, I view'd it often, and always perceiv'd, that there lay a great many Salt Particles of different figures coagulated, but could not diſcover the exact figure of the moſt of 'em, becauſe the Water did not exhale; but I ſuppoſed that there were Salts of two kinds therein, *viz.* the Salts that were already coagulated, and other Salts that ſurrounded the aforementioned coagulated Salts.

I view'd theſe Salt Particles in the afternoon, in clear Weather, in the month of *April*; and next day in the morning about 6 a Clock perceiv'd them to be ſurrounded with ſo many ſeeming Water-Particles, that one would be amazed to ſee it.

Amongſt the ſaid Salt Particles, when I had a verv clear view of them, I obſerv'd ſome of them of the ſame figure with the Cryſtals, to wit, Hexangular; and juſt as our Rock Cryſtal is of an Hexangular figure, ending in points of the ſame ſhape, ſo likewiſe had theſe coagulated Salt Particles two Hexangular points, as they are deſcrib'd by Fig. 12. between L and M.

I imagin'd to my ſelf, that in caſe the Rock Cryſtal in in its Coagulation had lain in ſuch a poſition, as not to be united at both ends, but only in the middle, they would then have been compos'd of two Hexangular points, as we ſee in *Salt Petre*, which in coagulating in the Water, and fixing one of its ſides to any other ſubſtance, is not only Hexangular, but the ends thereof, which run into a point, are not Hexangular like Cryſtals, but oftentimes of the form of a Chiſſile.

I ſaw a little Particle of Cryſtal, which tho very ſmall, I could perceive to be of a Triangular ſhape, two Angles of it being a little larger than the third, as is repreſented in Fig. 13. between N and O.

I ſaw alſo ſome Salt Figures like Fig. 8. between A and B, but they had a thickneſs in 'em which was viſible to the Eye, beſides a great many other irregular Salt Particles, which were ſo very numerous in a ſmall quantity of Water, that I was aſtoniſht at it.

I cauſed the Water, that almoſt always ſurrounds the Salt Particles, to exhale leiſurely by the warmth of a Candle, and then I could diſcover a great many coagulated ſmall Salts without any viſible figure.

II. *A Regiſter of the Weather for the year* 1692, *kept at* Oates *in* Eſſex. *By Mr* John Locke.

I Herewith ſend you the Copy of my Regiſter of the Weather, from the 9th of *Decemb.* 1691. to the end of the year 1692. It is fit I explain a little to you ſome things in the Table, for the better underſtanding of it.

The firſt Column, having D at the top, contains the day of the month.

That with H, the hour of the day, which beginning from one of the clock in the morning, I count round in one continued ſeries to 24, which is 12 a clock at night.

The Column *Ther* is that of the Thermoſcope, which was a ſealed one, whereof you will find a larger account hereafter.

The Column *Bar* marks the height of the *Mercury* in the Baroſcope.

The firſt number is the inches of its height, the ſecond number marks the 20th parts of an inch above that inch marked by the firſt number.

The Column *Hyg.* is that which marks the moiſture of the Air. The Inſtrument I uſed was the beard of a Wild Oat, of which each turn was divided into ſixteen degrees.

The Column of the Wind mark'd the point the Wind was in, but not always exactly, becauſe the Weather-cock viſible out of my Window was ſtiff, and turn'd not eaſily, nor was the Houſe it ſtood on ſituate exactly Eaſt and Weſt; ſo that it was not eaſie by the ſtanding of the Weather-cock to know exactly the point of the Wind: Wherefore I contented my ſelf to ſet down barely one of the 4 cardinal points, when the Wind was pretty near it; and when it was more remote, the two cardinal points between which it was, putting the Letter of the cardinal point firſt to which it was neareſt; as when the Wind was between the South and the Weſt, if it were nearer the Weſt than the South, I writ W. S. and ſo of the reſt.

I marked beſides the force of the Wind, which I divided into four degrees. 1. When it juſt moved the Leaves. 2. When it blew a pretty freſh gale. 3. When it was a hard and whiſtling Wind. 4. When it blew a ſtorm. Though theſe diviſions were not made with that exactneſs as they might have been, had one had an Inſtrument on purpoſe, yet they may give ſome help to thoſe who would make obſervations from ſuch Regiſters as theſe. (0) was when there was not Wind enough to move a Leaf as I could ſee.

As to the Weather. *Cloudy* ſignifies more of the Sky (viſible out of the Windows of my Study, which were Eaſt and South) cover'd with Clouds, than not. *Fair* the contrary.

Between when it was uncertain whether more of the Sky was cover'd or clear. *Cover'd* when no part of the clear Sky appear'd. *Cloſe* when the Sky was cover'd with one uniform thick Cloud.

I have often thought that if ſuch a Regiſter as this, or one that were better contriv'd, with the help of ſome Inſtruments that for exactneſs might be added, were kept in every County in *England*, and ſo conſtantly publiſhed, many things relating to the Air, Winds, Health, Fruitfulneſs, *&c.* might by a ſagacious man be collected from them, and ſeveral Rules and Obſervations concerning the extent of Winds and Rains, *&c.* be in time eſtabliſh'd, to the great advantage of Mankind. Whether you will think it worth the Royal Society's conſideration and promotion, I leave it to you. From this ſolitary one there is little to be collected. The pains is ſo little, that I indulg'd my Curioſity, when it coſt me the writing not ſo much as a line a day. For, though beſides the ordinary Obſervation, which I ſet down commonly every morning, there ſeldom happen'd any Rain, Snow, or other remarkable change, which I did not ſet down. But as you ſee, a few Letters and Figures do it; ſuch as it is I ſend it you, and if it may be of uſe to any one I ſhall be glad.

N. B. That the Thermoſcope mark'd 4, which I made uſe of till *Mar.* 7. 1701. was one of thoſe ſold by Mr *Tompion*, wherein 0 mark'd Temperate, and the Figures from thence increaſing both upwards and downwards, ſhew'd the increaſe of Heat and Cold from Temperate. *Sept.* 22. 1701. I began to uſe a new ſealed Thermoſcope, adjuſted to a Scale made by Mr *John Patrick* in the *Old Baily*, who places 0 at the top, ſuppoſing it to be the Heat under the line, and ſo the Figures increaſe downwards, with the increaſe of Cold. Temperate being placed at 45. This Thermoſcope is marked 5 in my Regiſter.

DECEMBER, 1691.

D	H	Ther. 4	Bar.	Hyg.	Wind.	Weather. *Decemb.* 1691.
9	16	1. 2	30. $\frac{4}{20}$		S. 1	Fog.
10	17	2. 1	4		S E 1	Fair.
11	10	3. 1	4		S E 1	Fog.
12	9	3. 6	3		E 1	Froſt, Cloſe.
13	9	3. 4	30. 0		E 1	Cloſe.
14	9	3. 7	29. 17		E 2	Froſt, Fair.
15	9	4. 2	30. 0		E 3	Froſt, Fair.
16	9	4. 4	4		E 3	Froſt, Fair.
17	9	4. 6	6		E 1	Froſt, Fair.
18	9	4.	5		N E 1	Cloſe.
19	9	3. 3	3		N E 1	Fog, Thaw.
	24		29. 19		1	Cloudy, a little Rain next morning.
20	10	3. 4	18		N 1	Cloſe.
21	9	3. 6	19		N 1	Fog, Froſt.
22	9	4.	18		N 1	Cloſe.
24	10	2. 6	14		S W 2	Cloudy.
25	21	2. 1	15			Fair.
26	21	1. 7	13		W 3	Cloſe.
	24		12			Rain before next morning.
27	18	1. 6	6			
28	16	2. 6	9		S W 2	Fair.
	22		8			Rain.
	24		7		S 2	Rain hard.
29	9	3.	4			Cloſe,& ſome time aft.Rain
	19	2. 7	4			Snow beginning at 6.
30	8	3. 7	10		N. W	Fair.

D	H	Ther. 4	Bar.	Hyg.	Wind	Weather. *Decemb.* 1691
31	9	4. 7	12		N W 0	Fair, hard Froſt.
	17	3. 3	10		S E 1	Cloudy, Thaw

JANUARY, 1692.

1	9	3. 7	29. 11	47	S E 1	Cloſe, Snow at 10.
2	9	3. 7	4	43	W 1	Fair.
3	9	3. 5	8	41	S 2	Clouds.
4	8	3. 6	11	43	S 1	Cloudy.
5	9	3. 7	13	43	S 1	Cloudy.
6	8	4. 3	11	36	S 2	Cloſe.
	16	4.	8	36	E 3	Cloſe.
	20	4. 2	6	41		Snow.
7	10	4. 1	7	45	E 2	Cloſe.
	24	3. 7	17			Cloſe.
8	9	4. 1	30	45	N E 1	Cloſe.
9	9	2. 6	29. 18	50	S 3	Cloſe.
	20		15			Rain.
10	9	2. 7	18	44	S W 1	Fair.
	12			26		In the Shade.
11	9	2. 6	30. 4	48	W N 1	Cloſe, with a little Fog.
	24	2. 5	30. 8	41		Very fair all the afternoon, now cloſe.
12	9	2. 7	9	44	*N* 1	Miſty.
13	9	3. 4	9	46	S 1	Cloſe.
14	9	3. 7	7	48	E 1	Fog.
15	9	4. 4	6	31	E 1	Fog, Froſt.
16	9	4. 5	2	45	N 1	Fair, hard Froſt.
17	10	4. 1	29. 18	43	N E 2	Cloſe, hard Froſt.
18	8	4. 1	12	35	N W 2	Fair, Rain and Snow for an hour about 16.

D	H	Ther. 4	Bar.	Hyg.	Wind	Weather. *January*, 1692.
19	9	3· 7	9	44	N W 2	Snow [illegible].
20	8	4· 5	5	43	N W 1	Fair. Some Clouds. Snow in the afternoon.
21	9	5· 7	6		N 2	Fair. Snow in the afternoon.
22	9	5· 6	9	18	N W 2	Very fair, hard froſt.
	10	6. 2				In a Northern Cloſet without Fire at any time.
	24	6. 5½				In the ſame Cloſet, very hard Froſt.
23	9	5· 7	11	31	N W 2	Fair, Snow a little at 14.
24	9		11	28	N W 1	Cloudy, hard Froſt.
25	9	5· 6	10	31	N W 1	Fair, hard Froſt.
26	9	6. 0	9	32	N W 1	Cloudy, hard Froſt.
27	7	5· 3	7	33	N 1	Cloudy, hard Froſt.
28	9	4. 6	4	33	N 1	Snow in the night, and Snow ſtill.
29	9	5· 6	2	32	W 1	Cloſe, Snow all afternoon.

N. B. I ſuſpect that from the 23d to the 29th incluſively, the Hygroſcope has been counted 16 Degrees, *i. e.* one whole turn, too high, it being all that while very hard Froſt.

30	9	4· 4	2		N W 2	Snow.
31	9	5· 3	8		N W 1	Cloſe.

F E-

FEBRUARY, 1692.

D	H	Ther. 4	Bar.	Hyg.	Wind.	Weather. *February*, 1692.
1	8	5. 0	10	19	W	Fog.
2	9	5. 6	11	19	W 1	Fog.
3	8	5. 7	11	20	W 1	Fog.
4	9	5. 5	9		E 2	Cloſe.
5	9	5. 4	7	26	E 3	Cloſe, Snow in the evening.
6	9	5. 1	29. 0	20	E 1	Snow.
7	9	4. 6	2		N 1	Cloſe Fog, little Thaw at 12.
8	9	4. 6	29. 0	40	N E 2	Fog, Snow in the night.
9	8	5. 3	29. 0		N E 2	Snow.
10	9	5. 5	1		N E 2	Cloſe.
11	8	6.	8		W 1	Fair.
12	9	7. 0	11		N W	Cloſe, Freezing exceſſively.
13	9	4. 2	5		S W 1	Cloſe Thaw. It may be obſerved between the Thermoſcope to day and yeſterday morning, there is the difference of two whole Degrees and $\frac{6}{8}$, a greater riſe than one ſhall ordinarily find. The Thermoſcope was unmoved in a corner of a very large room, out of all reach of the Fire whereby it might be alter'd.
14			7			Cloſe.
16	12		10			Cloſe.
17	19		9			Fog.
18	12		5		W	Snow.
26	2		11		W 2	Cloſe.
27	9	2. 3	29. 8		W 2	Fair. Rain from 15 to 19.
28	9	3. 1	6		W 1	Cloſe, Snow laſt night.
29	9	3. 6	6		S W 2	Cloudy, Snow laſt night.

MARCH

MARCH, 1692.

D	H.	Ther. 4	Bar.	Hyg.	Wind.	Weather. *March*, 1692.
1	8	2. 7	28. 17		S W 3	Fair.
2	8	3. 1	29. 5		S W 3	Fair.
3	7	2. 6	8		W S 2	Fair.
	16	1. 4	8		W S 1	Rain very gently till 20, hard till 23.
4	9	3. 1	14		N E 2	The Ground cover'd with Snow. Cloſe.
5	9	3. 4	18		W 2	Cloudy.
6	9	2. 4	11		W 2	Rain till 16.
	16	2. 0	9		W 1	Rain.
	22	2. 2	10			Fair.
7	9	3. 5	10		W 2	a little dropping.
	12		9		W N 2	Snow for ¼ hour.
8	9	3. 3	14		W 1	Fair.
9	8	3. 3	15	25	S W 2	Fair.
10	9	6	19	17	S 1	Fair.
	17	2. 2	18	19	W 2	a little Rain.
11	9	1	19	25	W N 1	Cloſe.
12	9	5	30. 1	23	N W 1	Cloſe.
	14	2. 0	30. 0	24	W N 2	Cloſe. Small Rain at 15 till 16.
	16	1. 7	29. 19	40	W N 1	very gentle Rain.
	23	7	16		N W 2	hard Rain for 3 or 4 hours paſt.
13	9	2. 3	13		W N	very gentle ſmall Rain.
	12		11		N W 2	Fair.
14	9	2. 6	11	27	N W 2	Cloſe.
	16	5	13	25	N E 3	Fair.

D	H	Ther. 4	Bar.	Hyg.	Wind.	Weather. *March,,* 1692.
15	8	4. 0	16	26	N E 2	Cloſe, Froſt laſt night.
16	9	3. 4	14	25	N W 1	Cloſe.
	13	0	13	20	N W 1	Fair. Rain in the night.
17	9	3. 0	8	25	N E 1	Cloſe.
	13		7		S E 1	Cloudy.
	18	2. 2	6		S E 2	Cloſe.
	19		5	29		Small Rain.
	23		4	35		Cloſe. Much Rain in the night.
18	8	2. 3	1	41	W S 2	Cloſe.
19	9	6	3	34	S W 2	Cloudy.
20	9	2	2	31	S 2	Cloudy. Rain laſt night, Houſes yet dropping.
21	8	3	3	29	0	Cloſe.
	14	1. 3	3	27	N E 2	a very little Shower.
22	8	3.	6	27	N E 1	Cloſe, a little very little Snow in the aftn. ☿ riſing.
23	8	3. 5	10	26	1	Clouds.
	17	2. 7	10	20	S W 1	Cloſe.
24	8	3. 5	29. 14	24	S W 1	Very fair, little Snow and Hail about 13, the ☿ falling a little.
25	8	2. 7	10	27	S W 2	Fair.
26	8	1. 6	2	35	3	Rain very little at night.
	12		5		S W 4	Cloſe.
	18	1. 0	7	29	S W 2	Cloſe.
	24		7	34	1	Hard Rain, the ☿ a little fallen.
27	8	1. 0	7	37	W S 2	Cloſe.
	17	0. 2	2	33	W 1	Small Rain.
28	7	0. 7	12	33	W 1	Cloſe.

D	H	Ther. 4	Bar.	Hyg.	Wind	Weather. *March,* 1692.
	16	0. 5	12	30	N 1	Fair.
29	8	1. 6	10	32	W 1	Rain. Rain a great deal laſt night.
	13		8	2	N 1	Cloſe, miſling Rain all this morning till now.
	15		7		N 1	Cloſe
	22	1. 6	5	31		Fair.
30	8	2.	1	32	W 2	Cloſe, Rain laſt night.
	15		2		N W 3	Rain, as almoſt all this morning.
	19		3		N W 3	Rain gently, as the great part of this afternoon.
	24		6			Fair.
31	9	3. 1	6	29	N W 1	Fair.
	24		3			Cloſe, Rain in the following part of the night.

APRIL, 1692.

D	H	Ther.	Bar.	Hyg.	Wind	Weather.
1	9	2. 6	2	32	S 1	ſmall Rain.
	24		1			The greateſt part part of the foregoing day gentle Rain.
2	9	1. 7	28. 16	39	S E 2	Cloſe, Rain a great deal laſt night, ſo as to make a Flood
	16	1	17		S W 2	Fair.
	24		19			Cloſe, Rain in the following part of the night.
3	9	2. 2	29. 0	23	N 2	Cloſe.
	14	1. 7	2	32	N W 3	ſmall Rain.
4	8	3. 4	10	30	N 2	Fair.

D	H	Ther. 4	Bar.	Hyg.	Wind.	Weather. *April*, 1692
5	8	3. 2	19	26	N W 1	Cloudy.
	14	2. 1	19	26	N W 1	Rain, the ☿ a little riſen, the Rain laſted about an hour.
	14	2. 1	19	26	S E 1	Rain.
	17	2. 1	19	26	S E 1	Rain.
6	8	3. 2	30. 3	27	N E 1	Cloudy.
7	8	3. 0	4	25	N 1	Fair.
	3		2	25		Cloſe.
8	8	2. 4	2	23	N E 1	Cloſe.
	42	1. 7	1	22		Cloſe.
9	8	2. 0	29. 19		N E 1	a little Fog.
10	9	3	30. 0	21	N E 2	Fair, $^{13}_{16}$|23 $^{16}_{16}$.
11	8	4	2	17	N E 1	not a Cloud 16|$^{15}_{10}$.
12	8	2	1	12	N E 1	ſcarce a Cloud 15|$^{9}_{14}$.
13	8	1. 4	34. 0	7	N E 1	not a Cloud.
	13	0. —2	29. 19	3	E 1	not a Cloud, but a thick air call'd a red Wind.
14	8	1. —0	16	10	N E 1	high Clouds.
	23	0. —3	15	8		Clouds.
15	7	0. —3	15	9	N E 1	very fair.
16	8	0	18	8	W 2	very fair.
17	9	0 3	17	6	S W 2	very fair.
	23	0. —6	16	7		ſmall Rain for a little while.
18	19	0. 1	15	18	S W 2	Cloudy.

In the Cloſet on the North ſide of the Houſe.

	15	0. 3	14	16	S W 2	Cloſe.
	23	0. 2	14	18		Rain.

D	H	Ther. 4	Bar.	Hyg.	Wind.	Weather. *April,* 1692.
19	9	1. 0	15	18		Fair.
	16	0. 5	15	16	S W 3	Cloſe.
20	9	0. —2	15	16	W 1	Fair.
	9	0——	6	18	S W 2	Cloſe, a little Rain this morning.
21	23	0. 4	1	27	2	Rain, as it had been moſt part of the day.
22	8	1. 1	29. 0	17		
30	24	2. 3	4	21	N E 3	Rain, and all the day before Rain.

M A Y, 1692.

1	10	2. 2	8	29	N E 2	Cloudy.

In the Chamber, on the South ſide of the Houſe.

2	8	2. 1	12	29	N W 2	Cloudy, Rain laſt night, ☿ was at 23 laſt night as now.
	18	3	11	27	1	Fair, 2 or 3 ſhowers ſince 8.
3	9	2	14	29	N E 1	Fair.
4	11	1	14	26	NW 1	Fair.
5	8	2. 6	16	23	NW 2	Cloſe.
6	8	6	16	24	NW 1	Fog.
7	8	0. —2	14	21	W 1	Fair.
	19		12			Rain.
8	9	0—— 3	17	16	N E 1	Cloudy.
9	8	0—— 2 1	19	13	N E 1	Fair.
10	7	2 2	19	12	N E 2	Fair.
13	17	0—— 2	19	5	N E 2	Fair.
14	10	1. 0	19	12	N E 2	Fair.

D	H	Ther. 4	Bar.	Hyg.	Wind.	Weather. *May*, 1692.
15	9	0——2	19	12	N E 1	Rain a little.
	16	0——4	19	13	N E 1	A few drops, the ☿ ſunk a very little.
16	7	0	17	13	E 1	Fair.
17	8	0——4	29. 14	8	N E 1	not a Cloud.
18	7	0——6	29. 12	5	S 1	Clouds, a little ſhower about 10.
19	9	0——5	12	6	W 2	Cloudy, *i. e.* more Clouds than clear Sky.
20	9	3	10	5	S E 1	Cloudy.

N. B. Cloudy ſignifies more of the Sky cover'd than clear. Fair ſignifies more open Sky than cover'd with Clouds.

21	9	0	9	6	S W 1	Cloudy.
	18	0——	9	5	S W 1	Rain for about an hour.
22	8	0——1	12	6	N E 1	Cloſe, *i.e.* the Sky nowhere to be be ſeen for Clouds, a ſhower about 17.
23	6	0——2	18	7	W 1	Fair, *i. e.* more Sky than Clouds.
	9	2	18	8	S W 1	Very Fair.
	15	0——1	18	7	WN 2	Hard Rain about ¼ of an hour.
	17	1. 1	18	7	S W 2	Hard Rain.
24	7	0——4	17	8	N E 1	
25	8	5	14	8	S E 1	
26	8	1. 1	10	6	E N 1	
	18	3	10½	8	N E 2	Cloſe, a Tnunder ſhower at 19, the ☿ being riſen to 11.
27	7	7	12	7	N E 2	Cloſe.

D.	H	Ther. 4	Bar.	Hyg.	Wind	Weather. *June*, 1692.
28	7	0 —— 1	14	7	N E 2	Cloudy.
	12	0 —— 7	14	9	N E 2	Cloudy.
29	8	1. 1	13	10	W 2	Cloudy.
	13	1. 3	13	10	W 2	Rain.
30	6	0 —— 2	15	8	W S 1	Cloſe.
	11	0 ——	13	8	S W 3	Rain till night.
	14	0 —— 1	11	9	S W 3	Rain.
	21	3	3	14	3	Rain hard.
	24	3	29.	17	4	Cloſe.
31	7	0 —— 3	1	14	W 4	Cloudy.
	24		2		W 4	Cloudy.
	24	1	4	12	2	Fair.

JUNE, 1692.

1	7	0 —— 4	6	12	W 3	Fair.
2	7	0 ——	4	13	W 2	Cloudy.
	10	0 —— 1	4	13	W 4	A ſhower for about ½ an hour, and then Fair and Calm again, at 11 Rain again, the ☿ a little raiſed. Several ſhowers in this day.
3	8	0 —— ½	13	14	W 1	Cloſe.
	9	0 ——	14	14	N 1	Rain a little.
4	6	0 ——	14	13	S 1	Fair.
	23	0 —— 7	7	13	1	Cloſe.
5	9	0 —— 5	4½	13	S W 3	Cloudy.
	12	0 —— 6	4	14	S W 2	Hard Rain ¼ hour, ſeveral ſuch ſhowers this aftern.
6	7	0 —— 5	29. 5	14	S W 1	Cloudy.
	10	0 —— 3	5	14	S W 2	Hard Rain ¼ hour.
7	7	0 —— 3	6	13	S E 2	Betwixt Cloudy and Fair.

D	H	Ther. 4	Bar.	Hyg.	Wind.	Weather. *June*, 1692.
	11	0——1	6	13	S E 2	Hard Rain $\frac{1}{4}$ hour, and a very great ſhower 1 hour, ☿ ſtanding as it was.
8	8	0——4	7	13	0	Fair.
9	9	0——1	6½	15	W S 1	Rain a good part of laſt night, & all this morning.
	24	0——6	11	18	2	Rain all the afternoon till 20 or 21, the ☿ all the while riſing, now Cloſe.
10	9	0——4	12	18	0	Cloſe, Rain the paſt morn.
11	9	0——	13	19	S W 2	Cloudy.
	11	0——3	14	19	S W 2	Rain $\frac{1}{4}$ hour.
12	9	0——1	17	17	S W 2	Very Cloudy.
13	8	0——7	17	19	W 1	Cloudy.
14	8	1. 1	16		W 1	Cloudy.
15	7	1. 0	15	18	N 1	Very Fair.

In my abſence, the Thermoſcope being obſerved, it was found from the 15th of *June* to the 11th of *Auguſt*, never to get ſo high as 3, and was very often below Temperate, ſo cold was this Summer.

AUGUST, 1692.

13	19	2. 6	29. 10			Cloudy, Rain about 21.
14	9	1. 5	29. 10		S W 2	Cloudy.
	11	1. 6	29. 10	17	S W 2	Rain.
	23	1. 0	12	17		Fair.
15	9	1. 2	8	25	E 2	Cloudy, Rain laſt night.
	12	1. 5	7	26	S E 2	Rain.
16	8	0——5	12	25	W 2	Fair.
17	8	0——2	15	21	S E 1	Fair.

D	H	Ther. 4	Bar.	Hyg.	Wind.	Weather. *Auguſt*, 1692.
18	7	1. 1	14	22	S W 1	Cloudy.
	24	2. 1	13	22		Small miſty Rain.
19	9	1. 4	15	22	W 2	Cloſe.
20	8	1. 1	18	20	S W 1	Very Cloudy.
21	8	1. 0	16	19	S 1	Fair.
	10	1. 3	16	19	W 1	Very Small Rain.
	12	1. 5	16		W 1	Very Cloudy.
22	8	1. 6	18	18	NW 2	Fair.
23	9	0——5	30. 0	16	S W 1	Not a Cloud.
24	8	0——3	30. 0	15	0	Not a Cloud.
25	8	1. 1	29. 19	15	S W 1	Not a Cloud.
26	8	1. 2	16		S E 1	Not a Cloud, ☿ gently ſinking ever ſince yeſterday morn.
	17	3. 5	16		1	Fair.
27	7	1. 5	14	12		Thick Fog.
28	8	1. 1	29 16	12	NW 2	Very Fair.
29	9	0——7	16	10	NW 1 rac. SE	Very Cloudy.
	17	1. 3	15	12	0	Cloſe, ſome ſmall drops.
30	8	0——5	13	12	NW 2	Cloſe.
	20	1. 0	12	13	N E 1	A little Rain.
31	8	0——2	13	12	NW 1	Very Fair.

SEPTEMBER, 1692.

1	9	1. 0	11	13	S W 3	Cloudy.
	12	1. 3	11	13	S W 3	A little Rain.
	14	1. 4	11	13	S W 2	Hard Rain for 1 hour, and ſoft till 17.
2	3	0——2	14	11	W 2	Fair.

D

D	H	Ther. 4	Bar.	Hyg.	Wind.	Weather, *Octob.* 1692.
3	9	0 —— 6	14	10	W 2	Cloudy.
4	8	2. 0	15	8		
5	8	1. 6	16			Very Fair.

OCTOBER, 1692.

18	22	0 —— 6	29. 11		W 2	
19	9	0 ——	4		S 3	Rain,
20	9	1. 2	5		S W 2	Very Fair.
	18	0 —— 3	2	16	S W 4	Rain.
21	9	1. 4	10	17	WN 2	Not a Cloud.
	24	0 —— 5	15	16		Rain.
22		0 ——	16	37	W S 3	Cloudy.
	16	0 —— 3	17	33	W S 2	Cloudy.
23	9	0 —— 3	17	33	S W 1	Cloudy.
	15	0 —— 3	16	24	S W 1	Fair.
24	9	0 —— 5	15	27	S W 2	Fair.
	14	0 —— 1	16	30	S W 1	Small miſt.
25	8	0 —— 5	30	30	W 2	Cloſe.
	15	0 —— 3	29. 19	29	W 2	Scarce a Cloud.
26	9	0 —— 5	16	28	W 1	Cloudy.
27	9	1 1	13	27	W 1	Cloſe.
	23	0 —— 7	13	27	1	Cloſe, a little miſling Rain good part of the aftern.
28	9	1. 0	15	28	NW 1	Cloudy.
29	9	1. 1	17	28	E 1	Cloſe, a little Fog.
		0 —— 7	18	29	E 1	Cloſe, a little gentle Rain about 15.
30	9	2 1	30. 1	26	E 2	Cloudy.
31	8	3 0	29. 19	18	N E 1	Fair.

D	H	Ther. 4	Bar.	Hyg.	Wind	Weather. *Novemb.* 1692.
	11	2. 6	18	19	N E 1	Hard Snow, which laſted till paſt midnight.

NOVEMBER, 1692.

D	H	Ther.	Bar.	Hyg.	Wind	Weather.
1	9	3. 5	29. 9	19	N E 1	Fair, ſcarce a Cloud.
2	11	4. 0	7	20	S W 1	Rime and Froſt.
	15	3. 6	7	20	S W 1	Snow, which began at 13 and laſted to 20.
3	9	3. 5	7	23	W 1	Cloſe.
	12	3. 0	5	25	W S 1	Rain, which began at 11 and laſted till 17.
	24	2. 0	1	39	3	Cloſe, Rain before 1, and ſo the greateſt part of night.
4	9	1. 5	3	40	S 2	Cloſe.
5	9	1. 4	13	36	N E 1	Cloſe, Rain laſt night.
6	9	2. 0	15	33	N E 1	Cloſe.
7	8	2. 2	16	32	N E 0	Cloſe.
8	9	2. 1	14	32	E N 1	Cloſe.
	16	2. 0	14	33	N E 1	Rain, which began at 14, and continued till 24.
9	9	2. 2	13	33	N 2	Small Rain for a very little while.
10	9	2. 4	17	32	NW 1	Not a Cloud.
11	9	2. 4	17	30	W 1	A little Fog.
	16	1. 6	14	32		Hard Rain.
12	9	1. 5	10	33	W 1	Rain.
13	9	3. 1	4	30	W 0	Fair, Froſt.
14	9	4. 2	12	28	NW 2	Very fair hard Froſt.
15	9	4. 6	16	26	W 0	Very Fair, hard Froſt.
16	10	4. 1	8	31	S 3	Cloſe, Snow laſt night from 11 the greateſt part of this day.

D	H	Ther. 4	Bar.	Hyg.	Wind.	Weather. *Decemb.* 1692.
17	9	3. 7	8	34	S 1	Very Cloudy.
	13	3. 0	6	35	S W 2	Rain.
18	8	4. 0	10	37	0	Fog, in the Cloſet on the North ſide of the Houſe.
26	22	4. 2	18		3	Cloſe, in the Cloſet on the North ſide of the Houſe.
27	10	4. 4	16	34	E 2	Cloudy.
28	9	4. 6	18	32	E 3	Fair, Froſt.
29	9	4 6	16	31	E 3	Cloſe, Froſt.
30	9	4. 5	18	33	E 3	Cloudy, Froſt.

DECEMBER, 1692.

1	9	4. 5	30. 0	33	E 2	Rain mixed with Hail, the Rain as it fell Froze, and continued miſling till 14 or 15.
2	9	4. 1	30. 0	38	S E 2	Rain, which began laſt night & laſted all this day.
	17	3. 4	29. 17	39		Fog.
3	9	3. 6	19	45	S W 0	Thick Fog Froſt.
4	9	2. 6	5	48	S 2	Rain all the morning.
	12	2. 3	3	49	S W 2	Cloudy.
5	10	2. 4	5	54	S W 2	Cloudy.
6	11	2	7	53	W 2	Cloudy, ſome Rain this morning.
7	9	3	3	54	W 2	Cloſe.
8	9	1. 4	28. 18	56	S W 4	Rain and Stormy Wind all this day.
	23	0	15	58	S W 4	Hard Rain.
9	9	4	16	55	S W 3	Cloudy.
	17	5	15	53	3	Hard Rain.

D	H	Ther. 4	Bar.	Hyg.	Wind.	Weather. *Decemb.* 1692.
	24	2. 1	15	52	3	Fair.
10	10	2. 4	29. 1	52	S W 1	Very Cloudy.
	24	3. 1	11	52	0	Very Fair.
11	9	3. 4	13	53	W 0	Very Fair.
	18	2	13	52	E 1	Very Fair.
12	10	3. 0	10	54	S 3	Cloſe.
	15	2. 6	6	53	S E 3	Rain a little and ſhort.
13	9	3	4	54	S E	Cloſe.
14	9	1. 6	5	56	S 2	Rain all day.
	18	1. 4	3	57	2	Rain yet.
15	9	2. 0	11	56	W 1	Very Fair.
	15	1	13	56	W 1	Thick Fog.
16	9	4	11	54	S 2	Cloſe.
	15	2. 0	11	57	S W 2	Rain from 12.
17	9	1. 6	14	56	S W 1	Cloudy,

In my Chamber on the South ſide of the Houſe.

	11	1	15	54	WN 1	Fair.
	17	4	17	49	WN 1	Fair.
18	10	2. 7	30. 3	43	E 0	Very Fair, hoar Froſt.
19	9	3. 2	0	43	S 0	Miſt. A Miſt is when the drops manifeſtly falls.
20	8	2. 6	29. 17	45	N E 0	Miſt, as it was all day yeſterday.
21	9	4	12	46	S W 2	Cloſe.
	19	1	4	48	S W 3	Rain.
22	9	1	6	48	S 1	Not a Cloud.
	24	5	0	42	3	Rain.

D	H	Ther. 4	Bar.	Hyg.	Wind.	Weather. *Decemb.* 1692:
23	9	3	28. 10	51	W 4	Rain, which had been all night.
24	10	3 2	19	45	W 1	Cloſe.
25	11	3. 3	29. 12	40	W 1	Fair, Froſt.
26	9	2. 0	3	57	S W 3	Rain all laſt night.
27	9	6	3	51	S 3	Cloſe.
	11	2	0	51	S W 4	Cloſe.
	12	1	28. 19	51	S W 4	Rain all day.
28	11	3. 2	18	48	S W 2	Rain.
29	9	6	29. 6	48	S 1	Fair Froſt.
	24	2	28. 19	47	S 4	Rain.
30	9	2. 3	11	57	W 4	Rain very hard all laſt night till now.
	24	3	17	48	4	Fair.
31	9	6	15	46	W 4	Not a Cloud.
	20	5	29. 8	39	2	Rain.
	24	4	10	40	1	Cloudy.

III. Memorabilia nonnulla Lacus *Vetteri*, Auctore *Urbano Hearne*, M. D. Sereniſſimæ Reg. Majeſt. *Suecicæ* Archiatro, & Conciliario Collegij Metallici ord. nec non Societat. Regiæ *Londinenſis* Socio.

QUandoquidem admiranda nonnulla ac inſolita de Lacu *Sueciæ Vetero*, *Olaus Magnus* aliiq; referunt auctores. Operæ pretium duxi, cum æſtivo tempore ad *Medevienſes* ſubinde Secederem Acidulas, in dicti lacus indolem & Scriptorem fidem penitius inquirere, inque iis quæ propriis obſervationibus experiri non liceret, eorum indagare teſtimonia, qui in vicinia habitantes, & antiqua commendati fide veris narrationibus meis ſatisfacere poſſent quæſtionibus. De his verò quidquid expiſcari contigit, Illuſtri Societati Regiæ lubens volui exhibere, ut non minus quid rarius ibidem accidat, eidem plenius innoteſcat, quam veritatem hiſtoriæ à commentis queat dignoſcere.

Accuratè adeo ſitum hujus *Vetteri* deſcripſerunt Geographi, ut fruſtra plenius eundem conarer exponere, quippe qui à Septentrione meridiem uſq; vergens, de *Askerſundio Nericiæ* ad *Jonekopiam Smolandiæ* 14 *Suecica* metitur milliaria, quorum quodlibet 5 vel 6 milliaria *Anglica*, & decem unum fere conficiunt gradum. Latitudine verò 3, nonnunquam vix 2 ſuperans milliaria, *Gothiam* in duas dividit partes, quarum quæ ad orientem ſita, *Oſtrogothia*, & ad Occidentem *Weſtrogothia* communiter nuncupater. Illius ad ripam cum Arce & civitate *Vadſtenenſi* celebris cernitur mons *Ahme* vel *Ohme*, ad hujus verò vetus illud *Weſtrogothiæ* oppidum *Hio*. Lacus autem ipſe ob elevatiores montium colles, qui hunc in ipſo litore ſæpius ambiunt, nonnunquam paulo remotiores prominent, adſtantibus ſemper apparet ad latera depreſſus. Profunditate gaudet inſigni, adeo vero inæquali, ut aliquibus in locis ad 80, in confiniis vero *Oſtrogothiæ* diverſis pauciſq; *Weſtrogothiæ* ad trecentas uſq; orgyas nullum reperius fundum. Confirmat hoc ſingulare quoddam experimentum, cujus me participem non ita pridem fecit vir omni honore & fide dignus Magiſter *Ericus Simonius* Paſtor & Præpoſitus *Vadſtenenſis* (qui longâ edoctus experientiâ, non pauca meæ curioſitati inſervientia ſubminiſtravit:) extitiſſe videlicet civem quendam *Vadſtenenſem* Benedictum *Amberni*, qui ut ad litora civitatis *Grennenſis Vetteri* exploraret profunditatem, aliquot centum Orgyarum funes, ſecuri loco ponderis appenſa, demiſerat, fundo autem nuſquam reperto, cum funes iterum collegerat, ſecuri deperditâ, cranium equi chordæ exactè alligatum obtinuit. Similis item abyſſus ad præcipitia montis *Ohmenſis*, quæ *parietis occidentalis* nomine inſigniuntur, rimantium ſcrutinia ſemper illuſit, ut ea propter non facile quiſquam his adpropinquare audeat metu Zephyri, qui ſubito increſcens, anchoris nequidquam juvantibus quamvis undiq; jactis ad declivia montium navigia facile protrudit. Pariter ad *Weſtrogothiæ* quandam plagam altitudinem aquarum metiri cupiens olim Gubernator Comes *Johannes Oxenſtierna*, projectis 300 orgyarum funibus nullum offendit fundum, prout hoc teſtantur piſcatores adhuc in vivis, quibus hoc negotii illo tempore committebatur. Limpida non minus quam profunda aquarum hæc eſt congeries, ut ad diſtantiam inſignem parvulus in fundo cernatur nummus. Ipſe Magiſter *Ericus Simonius* album vel denarium 60 immerſum cubitis aere ſereniore ſe fatetur obſervaſſe. A ſuperficie autem remotior aqua aliquâ quaſi viriditate tincta videtur: Et mirum ſane tot ſeſe in hanc exonerantes paludum, montium, ſylvarumq; ſordes, limpidam hanc aquam ne leviter quidem inficere.

Amplitudine licet multos noſter ſuperet lacus, ut plurimum tamen à Scopulis immunis pauciſſimis gaudet inſulis: Quarum præcipua Comitum *Brachæorum* antehac ſedes *Viſingſoe* dicta, in medio aquarum *Grennam Smolandiæ* & *Weſtrogothiam* interjacet, prout ad boream inſula *Roknenſis* Acidulis *Medevienſibus* è regione eſt oppoſita. Apparent & aliæ ad litora ſitæ inſulæ, pauciſſimæ tamen æquæ ac parvæ. Cum vero ventis ſic liberè expoſitus, proceris undiq; cingatur *Vetterus* montibus, nil mirum rarò eundem quieſcere, ſed procellis ſæpius agitatum, altioribus arctiſque fluctibus navigantium cymbas vehementer concutere ; Idq; adeo ſæpè inopinatò, ut aquis inſtar ſpeculi quietis tectè commoveri incipiat, antequam vel minima aeris ventilatio ſentiatur. Quod efficere videtur tempeſtas, ſub aquis aliunde oriunda, ſenſim eundem protrudens, priuſquam ventorum turbines eouſq; potuere derivari. Haud enim in *Vettero* infrequens furentibus ventis ferri navigia in uno loco, cum alia in confiniis ob tranquillitatem aeris remis propelli cernuntur. Indicio minimè fruſtraneo à ventis ſubterraneis irruptiones ejuſmodi aquarum abundè promoveri eodem plane modo, atq; ſimiles effectus explicare conatur *Varenius* in Geograph. Univerſ. Confirmant has ſuſpiciones Phœnomena diverſa. Imminente enim Tempeſtate imbribuſq; ululatus vel tonitru aquarum aere adhuc Sereno percipiuntur, quod mihi ipſi ad *Medevienſes* Acidulas, aurâ etiamnum placidiſſimâ, non rarò audire contigit ſubſequente ſemper turbine procelloſo. Manifeſtius adhuc hoc experiuntur incolæ *Viſingſoenſes*, quibus ab illo tractu inſulæ, unde die poſteriori venti oriuntur, inſtar ictuum tormentorum aures confuſè vellicantur. Cumq; ad orientem ejuſmodi rugitus deprehenduntur, utplurimum cum grandine & pluviis excitari ſolet Eurus. Conſideratione etiam dignæ variæ illæ ſunt ſufflationes, vaporum ſubitaneæ elevationes, & confeſtim proſilientes halitus, quos in hoc lacu nonnulli obſervavêre. Non abſque admiratione tale quid cum Sociis animadvertit Architectus *Abraham Winandz* qui has oras aliquando præteriens, aquis tum maximè quieſcentibus, ſtrictim hinc inde inſtar telorum è fundo ejaculari nubeculas conſpexit, qui deinceps fumi in aere ſeſe jungentes, levibus pluviis toto die peregrinantes infeſtarunt, quæ omnia ventorum ſubterraneorum præſentiam non incertè arguunt.

Idem procul dubio ventus, cum ſuperiùs adveniente procellâ in cauſa eſt, quod cum tempore verno glacies adhuc valida & ſpiſſa hac horâ equis trahiſq; ſuſtinendis abundè ſufficiat, alterâ, glacie evaneſcente ejuſdem ruptum per totum lacum repentè adeo contingat, ut qui paulo ante equis ſecure vehebatur, jam aqua undiq; patente ibidem placidè queat navigare. Antequam verò ejuſmodi metuenda irruptio, ſtupendus qui præcedit aquarum rugitus viatoribus fugam cum terrore ſuadet, qui tamen à litore aliquando remotiores, vel aquis extemplo immerguntur, vel ſuper glaciei fragmenta morti vicini aliquandiu vagari coguntur. Nonnunquam abruptè fundum petit glacies aere vel minimè commoto.

Num verò ſubterraneis ejuſmodi ventis excitandis metallici inſerviant halitus, hac vice in medio relinquo. Eos verò illic loci neutiquam deficere evincunt varii ad *Vetteri* boreales *Nericiæ Weſtrogothiæq;* plagas ſiti montes, venis martialibus, fortaſſe & metallicis nobilioribus nuperius detectis, aliiſq; mineralium ſpeciebus diverſis, Antimonio videlicet, Magneſia, Calce, Micâ ſterili nitido, Galenæ ſpeciebus, Ochrâ Pyriteque opulenter referti, unde Sulphur, Vitriolum, Alumen aliiq; ſucci minerales elici alioqui conſuevere. Quin in ipſis pariter aquis, non minor Pyritis quantitas quam Ochræ cujuſdam ferruginoſæ copioſa reperitur congeries, cujus fruſtula curioſitatis ergo non raro ipſemet collegi. Huc ignis referendus eſt fatuus, non ad litora ſolum frequentur obſervatus, ſed tempore nocturno in mediis aquis volitare & piſcatores confundere viſus. Quem creſcentibus metallicis ſulphurieſq; deberi halitibus plurimis eſt perſuaſum. Nec ſine Vaporum mineralium ope

Granati, Porphyrii, Jaſpides, Chyſtalli, ſelectiq; alii generantur in hoc lacu lapides, qui â beato Comite *Petro Braheo* olim collecti, & ad tantum redacti fuêre nitorem, ut inter ornamenta Sponſarum etiamnum *Viſingsburgi* adhibeantur. Quæ omnia metallicam agnoſcunt proſapiam, ut *Vettero* propinquas *Medevienſes* taceam Acidulas, quarum deſcriptionem Regiæ Societati proximè animus eſt exhibere.

Inter reliquas noſtri lacus proprietates admirationem ſanè non effugiunt inſignes ſub aquis vortices, torrenteſq; pertinaces, qui in hoc unico licet gaudente oſtio ventis fluctibuſq; directè obverſi piſcatoribus non leve faceſſunt negotium. Suſpicio hinc enata ob profunditatem inexhauſtam, clam ruentes alveos ventoſq; ſub terrâ genitos aliquam huic *Vettero* cum alio ab hoc ad occidentem X milliaribus *Suecicis* diſtante *Vennero* ſub tellure eſſe communicationem. Nec aliter ſuadent diverſæ voragines hos lacus interjacentes, quarum duas paræciæ *Fægrenſis* voraginum albæ & nigræ nomine inſignitas, metiri curavit Dominus *Haddorphius* celebris in *Suecia* Antiquarius, altitudines verò deprehendit immenſæ, motumq; in his obſervavit inteſtinum, ac ſi fermento turgidæ extitiſſent. Eidem opinioni fovet, quod abſq; cauſâ manifeſtâ certis annis augeatur noſtra aqua, cùm ſequentibus notabiliter iterum decreſcat. Animadvertit Paſtor *Motalenſis* Dominus *Daniel Rydelius* præteritis hiſce ſeptem Annis, certis quibuſdam in locis ſenſim adeò evanuiſſe *Vetterum*, ut ad aliquot orgyas ſicco pede illuc ambulare potuerit, quo cymbis antea vehi cogebatur, pluvia interea temporis, annis videlicet 1680, 1682, 1684 & 1685 undiq; abundantes. Anno verò 1686 verſus autumnum aqua paulatim iterum cernebatur augeri ad hunc uſq; annum 1688. An vero ſtata ſic ſervet tempora noſter lacus, ac *Vennerum* ſingulis ſeptem annis accreſere ſeptemq; viciſſim diminui ejus rimatores contendunt, de hoc certi quid determinare nequeo. Admiratione itidem eſte dignum, aere ſereno tormentorum ibidem ſentiri exploſiones, *Holmiæ* aliiſq; in locis ad 30 milliaria diſtantibus inſtitutas. Ut cum Anno 1685 Regii

Principes *Holmiæ* ſepelirentur horâ quintâ quilibet ictus exactè perciperetur. Pari facilitate tela Anno 1676 in pugnâ navali exploſa ad 30 circiter milliariâ diſtinctè fuere obſervata.

Quæ verò de *Gilberti Spelancâ* in inſula *Viſingſuenſi*, *Olaus Magnus*, *Meſſenius* aliiq; hiſtorici referunt, auctorum ſint relicta fidei. Hoc equidem conſtat reperiri adhuc cavernam & quidem fœtore refertam ſulphureo & nauſeabundo, quem aſſentientibus accolis ipſi ſpeluncæ prope aquas in palude ſitæ & collecto per longius tempus ſqualori, ſulphureos, uvidoſq; exhalanti Vapores potius adſcribendum cenſeo, quam cauſis quibuſvis vulgò allegari ſolitis. Cum etiam in his ſimplex antiquitas levitatem in fabulis credendis facile prodiderit, utut de eodem *Gilberto* ejuſq; Præceptore *Catillo Runske* ſtupenda non pauca referantur. Adparere interim in confiniis diverſa ſpectra & phantaſmata, quæ ut plurimùm fæminarum, aliquando equorum vel alius animalis ludricrâ ſpecie ſeſe ſiſtunt, nemo hiſce curioſitatibus intentus inficiabitur. Evincerent hoc ipſum diverſæ vetuſtioris æq; ac recentioris ævi hiſtoriæ, niſi obiter ſolum ſingula hac vice decreviſſem peſtringere.

Nec ſilentio præteriri debet celebris iſte amnis *Motala*, qui unicum uti dictum *Vetteri* noſtri oſtium, certis temporibus fluiditatem quaſi deponere, & in decurſu adeo ſolet ſiſti, ut liberò hunc ingredi, piſceſq; in fundo relictos abſq; impedimento capere nonnunquam fuerit conceſſum. Prout Anno 1682 & 1685 tempore *Nataliticorum Chriſti* idem eveniſſe conſtat. Vulgo & accolis unanimiter eſt perſuaſum, impunè nunquam Fluminis retardationem contingere, niſi vel caritatem anonæ ingentem, vel Bellum, vel qualecunq; publico præſagiat detrimentum, æque ac Balænarum in *Tameſin* ingreſſus *Anglis* fatale quid portendere perhibetur. Mihi verò ut Phyſico, naturales mirandorum effectuum cauſas unicè inquirenti quibuſcunque narrationibus ſatisfieri non potuit, niſi naturæ legibus eaſdem deprehenderim conformes. Sollicitus idcirco in iis fui examinandis, quæ lucem huic

Phænomeno fænerari videbantur, licet fluminis retardationem coram ſpectare nunquam licuerit. Utut verò variè hanc rem explicare conentur huic amni vicini, illo inſtanti aquas à litoribus recedentes fundum petere rati, ſemper tamen ſuſpicio mihi oborta fuit, vel glacie vel nive fluminis infima obſtructa, munimentum aquis præbuiſſe inferioribus interea ſeſe in Mare exonerantibus. Anſam huic opinioni dedit T°. Quod nunquam vere, Æſtate vel Autumno, ſed ſemper tempore *Natalitiorum Chriſti* vel novi Anni iſthæc contingerit mutatio. T°. quod prope pontem ſemper contigerit, ubi aquis ultra tres ulnas minimè profundis, aggerum lapidumq; acervi quibus Pons innititur, fluminis decurſum refrænant. Hanc ſuſpicionem veritati conſonam teſtatur propria & aliorum experientiâ ſuffultus Paſtor Eccleſiæ *Motalenſis* in limine pontis habitans, qui herbus longiores, ut Potamogetan, Polygonum aquaticum, *&c.* a ponte ad propinquos anfractus in aquis germinare aſſervit, & his glaciem ſtriarum inſtar & nivis congelatæ adhærere, quæ à flumine detruſâ & in pontis fundamenta delata tractu temporis cumulari & toto amni ſiſtendo ſufficere poteſt. Fatentur pariter molitores ibidem habitantes, imminente fluxus cohibitione, niveas quaſi moles è lacu derivari, quæ corpori, cui impingunt, inſtar glutinis adhærentes, fundum ſenſim petunt. Nec infrequens aquas per totum lacum uno die æqualiter quietas, altero irritatas prope pontem ſiſti. Quidquid verò ſit mirationem adhuc ſubit, non hyeme intenſiſſimo, ſed aere clementiore, & quidem ut plurimum circa ferias Natalitias, & novi anni retardionem contingere. Frigus fortè ſub aquis adhuc viget, licet in aere ceſſaverit, vel glacies debilius congelata herbis aliiſq; impedimentis detenta, obſtructiones haſce parit.

Antequam verò de tabula manum detraxero, ſilentio neutiquam præterire poſſum ea quæ de fonte quodam non longè à *Vettiri* litore in paræcia *Nyenſi* (ubi & Acidulæ *Medevienſes*) prope Templum & Paſtoris ædes ſito, ex ingenua parochi digniſſimi D. *Jonæ Frodelii* aliorumq; relationibus haurire licuit. Eſurinum hunc fontem vel annonæ appellitant vatem, eò quod nunquam aquâ ſufficienter repleatur, niſi annonæ ſuccedat ſequente Anno caritas. Ambiunt hunc fontem undiq; colles arenoſi molliores. Interjacet hos vallis depreſſa, ſed minimè paludoſa. Ex hac occultis meatibus hæc Scaturigo promanat, in eo ſingulare quid obtinet, quod Æſtate pluviis abundante ut plurimùm evadat aridus, cum viciſſim æſtatibus ſiccciſſimis, inſtante fame, ut & ſecundum alios (quos attingere non vacat) bello, Regiam *Motalenſem Vadſtenenſemq;* viam inundet, prout multorum ibi habitantium evincunt teſtimonia. Anno 1685 pluviis & imbribus frequentiſſimo, penitus hic fons exaruit, nec ultra dimidium pedem ſqualida. Anni 1686 æſtate aqua accreſcere viſa eſt. Nec veritatem hujus narrationis in dubium revocare preſentis anni permittit ſicciſſima æſtas, quâ cum aquis penitus vacui evaſerunt fontes vicini omnes, hic aquâ quam maximè abundavit. Quamvis autem vel fabulam vel ſuperſtitionem multis hæc narratio fortè ſapiat, â veritate tamen neutiquam aliena plurimorum firmata eſt experientiis, ut vel hinc eluceſcat, intimius recondita eſſe naturæ arcana, & innumera potius denſiore ſub velo latitare, quàm ut iiſdem enucleandis ſufficientes nos arbitremur. Si tamen ad ſequentia hac in parte attendere velimus momenta, faciliore negotio forte res expedietur.

1. Soli *Oſtrogothiæ* ex locis fonti proximioribus annonæ denunciari carietatem.
2. In totâ hac Regione fontiſq; præcipuè viciniâ arenonoſum eſſe campum, parte etiam aliquâ limo duriore gaudente, quibus impnægnandis ſufficiens ſemper requiritur lympha, proinde etiam.
3. Deficere ibidem ſegetes non niſi in ſiccioribus annis, cum contrarium obtineat *Iemptia*, aliæq; provinciæ nonnullæ ſeptentrionales.
4. Meteororum tempeſtatiſq; proventum, terræ & quidem ſub ſuperficie latentis aliquando ſequi indolem.

5. Prope colles arenoſos venis non patentibus per ſabulum quaſi colaturâ trajectas collegi aquas hujus ſcaturiginis.

6. Phyſicas ob cauſas imminente tempeſtate ſicciore, augeri vel abſcendere poſſe eas aquas, pluvioſâ iterum decidere, quæ prolixius deducere alterius erit temporis & inſtituti.

Sapienti interea ſat dictum ratus, hiſce accuratè perpenſis non ſtatim pro fictis reputanda confido, quæ rationi non extemplo pateſcunt.

Pauca hæc de *Vettero* animus fuit referre, ut non minùs quid veri de eodem traditum fuerit eluceſcat, quam fide temerè indignum non cenſeatur, quidquid primus non percipit intuitus. Multa ſic penitius indagari deberent, quæ ab *Olao Magno* deſcripta ad fabularum ſeriem vulgò rediguntur, quæ veritati tamen conſona hyperbolicè nonnunquam ab eodem proferuntur.

IV. *Experiments on the Reſilition of Bodies in Common Air*, in Vacuo *and in Air Condens'd, made at a meeting of the Royal Society at* Greſham College. *By Mr* Francis Hauksbee.

HAving provided a tall Glaſs Recipient, in whoſe upper part I had a contrivance to lodge 4 Marbles, and from thence ſucceſſively could drop them on a Plane at pleaſure; by which means, opportunity was given to make the more deliberate obſervations. But before I proceed to relate the Experiments themſelves, I think it will be neceſſary firſt to take notice, that the diſtance of the deſcent of each Marble on the Plane was about $13\frac{1}{2}$ inches. The weight of two Marbles 59 Grains, the other two 63

Grains; being all of the ſort generally ſold at Toy ſhops. The Plane whereon they dropt was a round flat piece of ſolid Glaſs, about an inch thick, and 3½ over; whoſe upper ſurface was well Grownd and Poliſht. It was fix'd in a Tin frame, contriv'd on purpoſe to keep its lower ſurface from being contiguous to the Plate or Leather, on which the Recipient was plac'd; (which I mention purpoſely, leſt any Gentlemen, who may have the curioſity to repeat theſe Experiments, ſhould fall into an error I very narrowly eſcap'd) for when firſt I made theſe Experiments I us'd a Stone Plane laid careleſly on the Leather that cover'd the Plate, over which the Recipient being plac'd, and the Air exhauſted, the deſcending Marbles would not rebound ſo high by an inch, as when the Experiment came to be made on the ſame Plane in common Air; which unexpected Phænomenon gave great umbrage that it might proceed from ſome unheeded cauſe, and ſeveral reaſons were alledg'd againſt the candour of the Experiment; the principal of which was, that the ſwelling of the Leather *in vacuo* raiſed the incumbent Plane, cauſing it to lye more hollow and ſoft than it did in the open Air. In order therefore to ſet the Experiments in a true light, I procured the prementioned Glaſs Plane, on which, when I came (as before) to drop the Marbles, their Reſilition then was ſomething more *in Vacuo* than in common Air (which put it paſt all doubt, that the Error proceeded from the cauſe ſuggeſted.) Thoſe dropt in common Air had likewiſe ſome ſmall advantage in their rebound, above thoſe let fall in Air condenſed. The Condenſation being but one Aſmoſphere, not daring to venture more, the breaking of the Recipient being very hazzardous. The Reſilition of the Marbles from the Plane *in Vacuo* was about 10½ inches, which was ſomething more than ¾ of their deſcent. In Condenſed Air their rebound was about 10 inches. Accordingly we muſt account their Reſilition in Common Air to be the medium of the other two, it being difficult to judge to a nicety in ſo ſudden a motion ; but there was a ſenſible difference betwixt the rebound of thoſe dropt *in Vacuo*, and thoſe in Air condens'd. I could not obſerve that the ſmall difference in the weight of the Marbles made any diſcernable alteration in their Reſilitions.

V. *An Experiment on the deſcent of Malt duſt in the Evacuated Receiver, at* Greſham College. *By Mr* Fr. Hauksbee.

I Took ſome Malt duſt, and having well dryed the ſame, put a quantity of it into a fine Muſlin Bag, where being looſely incloſ'd, would upon ſhaking diſcover it ſelf plentifully in the open Air, undulating and floating a conſiderable time before it would deſcend ; but being included within a Receiver, from which the Air was well exhauſted ; and then ſhaken, the duſt deſcended as a ponderous Body, precipitating in ſtrait lines from the top to the bottom of a tall Receiver.

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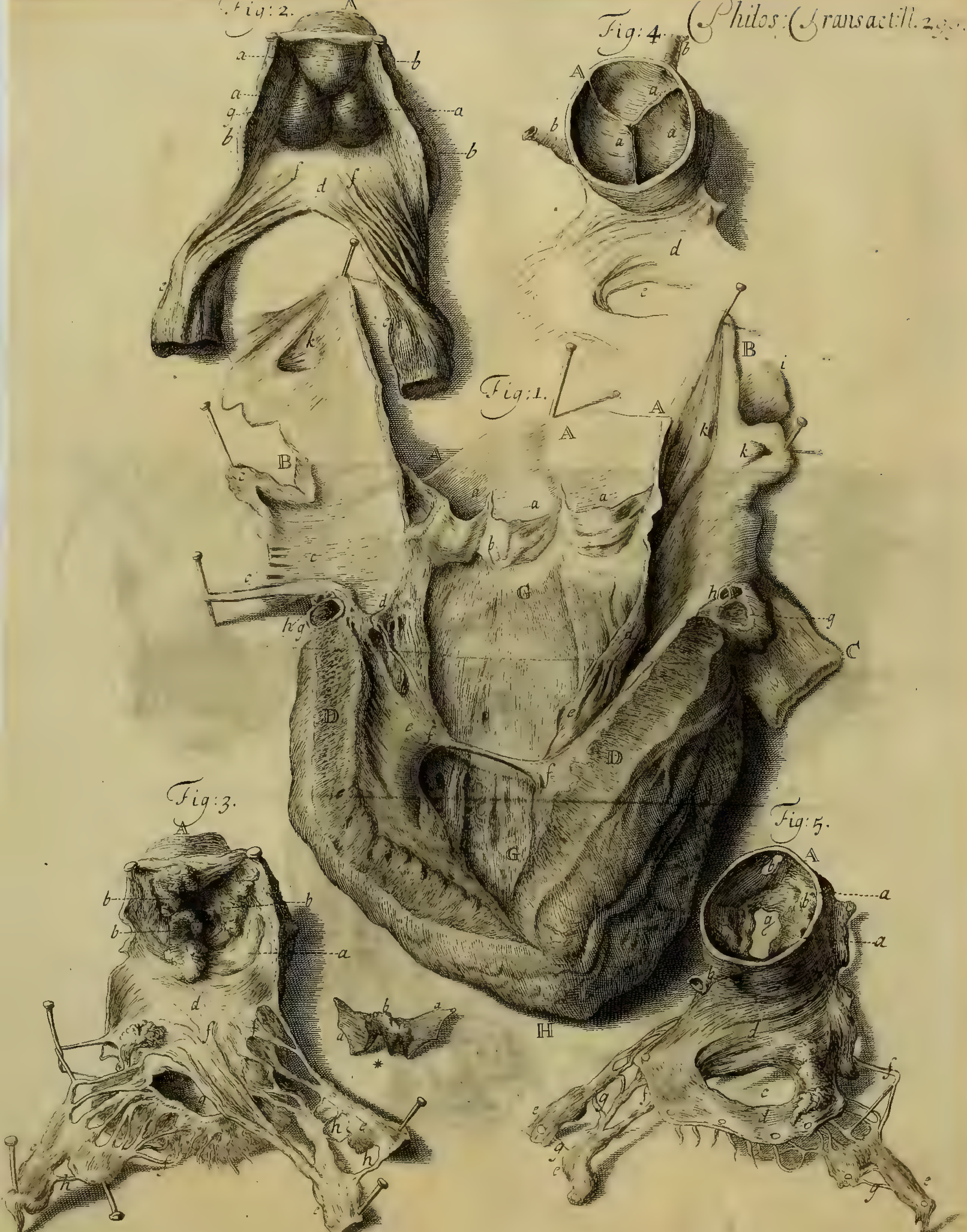

M. V.der Gucht Sculp.

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PHILOSOPHICAL TRANSACTIONS.

For the Month of May, 1705.

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V. De Aure Humana Tractatus; In quo integra Auris Fabrica, multis novis Inventis, & Iconiſmis illuſtrata, deſcribitur; omniumque ejus Partium Uſus indagantur. Quibus interpoſita eſt Muſculorum Uvulæ, atque Pharyngis nova Deſcriptio, & Delineatio. Auctore Antonio Maria Valſalva Imolenſi, Philoſophiæ & Medicinæ Doctore, in Bononienſi Univerſitate ad Inciſionem & Oſtenſionem Anatomicam Profeſſore Conducto, necnon Noſocomii Incurabilium Chirurgo, Bononiæ MDCCIV. *In Quarto.*

I. *An Account of Animals and Shells ſent from* Carolina *to Mr* James Petiver, *F. R. S.*

Sect. I. The *Cruſtaceous Animals* are,

1. THe *Thorny-edged* CAROLINA *Crab.* Cancer CAROLINIANUS marginibus ſpinoſis. *an* Guaja *alia ſpecies* Marcgr. 182. fig. 183. 1 ? *an* Pagurus *Reidjungan* Rumph. Hiſt. Nat. *Amboinæ* p. 11. c. 8. Tab. 7. Fig. R ?

Each ſide of this Crab is arm'd with a ſtrait and ſtrong Thorn, the Edges from thence to its Mouth is beſet with many ſmaller, as are ſome parts of the Claws, particularly next the Body; its Back is variouſly ponnc't with Sand like Warts, which, with other particulars, will be beſt underſtood by its Figure, which I deſign in my 3d, if not in my 2d Book of Decades. *This* Crab *our Worthy Friend* Dr Liſter, *her Majeſty's Phyſician, was pleaſed to give me.*

2. The red blotted CAROLINA Crab.

Cancer CAROL. lituris eleganter rubris *GAZOPHIL. NAT. Tab.* Fig. *an* Cancer, marinus lævis *Rumph.* Hiſt. N. *Amboin.* p. 10. c. 7. 1. Tab. 6. Fig. N ? *The variable ſpots on the back of this are more eaſily known by the Figure I have given of it than can be expreſt in words.*

3. Cancer *an* CAROL. ruber, vermiculis quaſi, maculiſque palleſcentibus. *Its* Back *is red like a boiled* Lobſter, *and interſperſt with ſmall pale ſpots, and intorted ramifications, reſembling our* White Falmouth Corall, *but muc hleſſer,*

tho' in ſome places more branched. I take this to be a Carolina Crab, *but are not certain, however in the interim it may be diſtinguiſhed by the name of the* Vermicular Red Crab.

4. *The 5 holed* CAROLINA *Sea-Urchin or Fritter:* Echinus compreſſus CAROL. &c. *Muſei Noſt.* 125. Fig.

This is a very ſingular Animal, having 5 oblong perforations thro the body of the Shell, viz. *4 againſt as many points of a 5 ray'd Star, lying in the midſt of the Shell; the other is placed between two of its beams, as may be plainly ſeen and underſtood by my* Figure *: theſe are of different magnitudes, having ſeen them from leſs than 2 inches to almoſt 4 diameter, and this laſt, in the midſt, where its thickeſt exceeds not half an inch, and gradually to its edges, which are thinner than a Shilling.*

I am obliged to my very generous Friend Dr Liſter *for the firſt of theſe wonderful Animals, and very lately to* Madam Williams, *a Gentlewoman whom I am alſo highly obliged to, for moſt of the following Shells,* viz.

Sect. II. *Bivalves,* of which kind are *Schollops, Cockles, Oyſters, Muſcles,* &c. in mentioning theſe and other Tribes, I ſhall follow the accurate Order of *Dr Liſter's Hiſtory of Shells.*

5, Mytulus CAROLIN. latus ſtriis rugoſis.

An *Pectunculus* ſtrijs planis & dentatis inſignitus *Liſter* Hiſt. *Conchyl.* L. 16. 3. Tab. 242. Fig. 79? *Theſe vary in bigneſs; a valve of the largeſt, which was 2 inches long and three quarters broad, weighed* ʒiijß. *The Noſe lies in the midſt of its hinge; the* Striæ *are flat and milled, like the edges of a new Shilling: each Valve is flattiſh at one end, and compoſed of about 8 furrows. My late kind Friend* Mr Robert Rutherford *I am obliged to for the firſt of theſe Shells.*

6. *Mytulus* JAMAICENSIS Pectunculi noſtri eſculenti facie *nobis.* Pectunculus denſe ſtriatus, margine fere inæquali & ſinuoſo Liſt. *Conch. L.* 3. *Tab.* 229. *Fig.* 64.

This is diſtinguiſht from the laſt in being leſs, having ſmaller Striæ *and ſmooth (much reſembling our* common Cockle, *Muſ.Noſt.*835) *but particularly in being Ear-noſed,*viz. *inclining more towards one end of the hinge, whereas the laſt was in the middle. I take the native colour of this Shell to be Cheſtnut, but the dead ones change black or white, as they are either dy'd in the Mud, or blancht by the Sun on the Shore.*

7. Chama CAROL. levis & lævis.

All of this kind were dead Shells, ſo that I can ſay nothing of their Colour; a valve of the largeſt, tho 2 *inches and* ¼ *long and about an inch and* ¾ *broad, and* ½ *inch high, weigh'd but* ʒj *and* ¼ *and* 6 *grains,* i. e. *in all* 81 *grains, yet ſome of the ſame dimenſions weighed a few grains heavier.*

8. Chama CAROL. parva, faſcijs fere lævibus.

This Shell reſembles our Nut-Muſcle. *Muſ. noſt.* 831. *but is thicker and one end pointed; we have an* Engliſh Sea Shell *like this, which I may in a little time have an occaſion to ſpeak of.*

9. *Chama* CAMPEACHEANA alba, faſciata tenuis.

Pectunculus albus tenuis rhomboides, rarioribus faſcijs exaſperatus *Liſt.* H. C. L. 3. Tab. 308. Fig. 141. The white Campeachy Spoon-Muſcle.

This Shell is ſo thin and brittle, it rarely comes to us whole. The curious Dr Liſter *gave the firſt of theſe,* ♃ Auguſt 19, 1697. *and my kind Friend* Mr Fifield, Surgeon, *has ſince brought it me from the* Iſland of Triſs, *and* Madam Williams *has now ſent me one of the largeſt and faireſt I have yet ſeen, the Valve* 3 *inches long,* 2½ *broad and* 1 *deep, yet weighed not* ʒij *and* ℈ij.

10. *Muſculus* BARBADENSIS exiguus, cardine ſerrato.

Muſculus parvus, ſubluteus, anguſtus, leviter ſtriatus *Liſt.* H. C. L. 3. Tab. 365. Fig. 205. The ſmall Barbadoes Muſcle. *This is a deep, thin, light, ſmall, finely ſtraited Shell; a pair of the largeſt was but an inch long,* ½ *inch broad, and both valves not* ½ *inch deep, weighed ſcarce* 6 *grains; by theſe*

heſe marks and its long notcht hinge, it's eaſily known from moſt others.

11. *Muſculus* CAROLIN. albus, faſciatus. 11

The Figure *of* Dr Liſter's Jamaica *Tellina* tenuis ad umbonem extra maxima rubeſcente L. H. C. l. 3. Tab. 397. Fig. 236. *in bigneſs, ſhape, thinneſs and* faſciæ *very well reſembles this Shell, which is ſomewhat narrower, and I meet with none of that redneſs he ſpeaks of; the moſt lively have a yellowiſh caſt within. A Valve of 3 inches and* $\frac{1}{2}$, *long and near* 1 $\frac{1}{2}$ *broad, weighs but little more than a dram; it's very ſhallow,* viz. *about* $\frac{1}{8}$ *of an inch deep.*

12. *Muſculus* albus JAMAICENSIS ſplendens radiis rubris. 12

Tellina magna albida ex rubro late radiata L. H. C. l. 3. *Tab.* 393. Fig. 240. The red Beam'd Jamaica Muſcle.

This elegant Shell Mr Charles Dell *ſent me once from the* Lands-end *of* Cornwal, *after that* Major Halſtead *brought it me from* Carolina, *and* Mrs Rachel Chapman *lately from* Antegoa. *I have a fair little pair, which weighs but 7 grains, and the half of another,* viz. *one Valve, which weighs* 127. *This laſt is near 3 inches and* $\frac{1}{2}$ *long,* 1 *and* $\frac{3}{4}$ *broad, and little more than* $\frac{1}{2}$ *inch deep: The dead Shells are white and ſhining, the others have red beams, which ſhoot from the hinge, and are broader at the edges; theſe are ſometimes more conſpicuous within than without; the laſt red, that decays in this Shell, is the Noſe of its Hinge.*

13. *Muſculus* CAROLIN. anguſtus. *an* Tellina alia *Braſiliana Bonan.* Conchyl. p. 163. Fig. 353? 13

This ſeems to be very well expreſt in Dr Liſter's Hiſtory *under the name of* Chama anguſtior ex altera parte ſinuoſa L. H. C. l. 3. Tab. 421. Fig. 265. *who had it from* Barbadoes. *I have not yet ſeen it from thence, but have this to ſay of ours,* viz. *I find it of differing ſizes, the common or middling is 3 inches long and above one broad, (I always mean where wideſt) the depth of a ſingle Valve not* $\frac{1}{4}$, *all of which ſize weigh more than* ʒj, *ſome heavier, but none leſs.*

14 14. CAROLINA Diſh Cockle, *Muſ. Noſt.* 383. *Liſt.* H. C. l. 3. Tab. 328. Fig. 165.

I have a fair pair of theſe, near 4 inches between the ſides, and 4 ½ from head to tip, the Shell 3 inches and ½ high, yet weigh'd not 6 Ounces. A ſingle Valve of a larger I have which weighs ℥j, and will contain half a pint of Water; it may conveniently be uſed for a drinking Cup or Porringer, and tho a thin light Shell, yet not eaſily broken.

15 15. CAROLINA Egg-Cockle. *From its ſhape, ſmoothneſs and colour, the largeſt of theſe may be ſomewhat bigger than a Hens Egg, and decline gradually to the ſmallneſs of a Nutmeg. They are pretty ſlick white Shells, and may ſerve for Dram Cups,* &c. Mrs Rachel Chapman *brought me this from* Antegoa; *they are alſo found on the other* Iſlands, *as well as on the* Continent, *from whence* Major Hallſtead *hath obliged me with it.* Muſ. Noſt. 840. L. H. C. l. 3. Tab. 249. Fig. 83.

16 16. VIRGINIA Fritter Cockle. *Muſ. noſt* 842.

Dr Liſter *in his* Hiſt. Conchyl. L. 3. Tab. 288. *has given a very exact* Figure *of this Shell; it's round, flat and fine girdled; the common ſize is of the following dimenſions,* viz. *from head to the oppoſite edge 2 inches and ½, and from ſide to ſide 2 ¾. The whole Shell wants of* ℥j *and ¼, and is not an inch high.*

17 17. *Pectuncellus* BRASILIANUS, albus, undis capillaceis majoribus. *Pectunculus* parvus albus, profundior tenuiter undatus L. H. C. l. 3. Tab. 301. Fig. 142. *an* Tellina *Braſiliana* lactea *Bonan.* Hiſt. Conchyl. 163. Fig. 349. The white *Braſile* File.

I have not yet ſeen them ſo large as Bonanni's Figure *repreſent.* Dr Liſter's Icon, *which is very good, is as big as we generally meet them; this is diſtinguiſh'd from the next in being ſomewhat a thicker and higher Shell, the undulated* ſtriæ *much larger and very conſpicuous.*

18 18. *Pectuncellus* JAMAIC. rubeſcens, undis capillaceis tenuiſſimis. *Pectunculus* tenuis ſubruber, minutiſſimis

ſtriis undatis exaratus L. H. C. l. 3. Tab. 339. Fig. 176. The fine bluſh *Jamaica* File.

This Shell muſt be ſtrongly viewed to diſcover the elegant fineneſs of its waved ſtriæ, *reſembling the fineſt File I ever ſaw.*

19. *Tellina* parva radiata &c. GAZOPHYL. NATUR. Tab. 18. Fig. 4. The *Dominico* Tellen. *From the plenty of them on the South part of that Iſland, where Mr* James Penman *found them, and it was the only Shell that Shoar abounded with. They rarely exceed an inch in length, and half that in breadth, and ſuch a Valve weighs but* ℈ß. *The fair ones of theſe are pretty Shells, and frequently found in Rock-work.* 19

20. *Pholas* CAMPECHEANUS anguſtus,muriculatus,cardine foraminoſo *nobis.* Pholas anguſtus albus, ſtrijs tenuibus exaſperatus L. H. C. l. 3. Tab. 432. Fig. 275. *whoſe* Figure *repreſents the right Valve,* viz. *that, that holding the outer part upwards, has its hinge, as you look on it in that poſture, againſt your Right hand; but what is ſtrange, I have not one Shell on that ſide the* Icon *repreſents it, amongſt* 20 *others, and therefore probably the Dr's Figure may be reverſed from one of theſe. The largeſt* Valve *I have yet met with is about 4 inches and ½ long, and* 1 *and ¼ where the broadeſt,* viz. *croſs the hinge, whoſe external holes in one of this proportion takes up an inch exactly, and they are generally about* 12 *in moſt ſizes; internally from the midſt of this, a thin furrowed lappet exerts itſelf near ¼ of an inch from the ſide of the Shell, by reaſon of which ſtanding out, it's eaſily broken, and therefore not always met with. This* Valve *wanted about* ℈ß *of 2 drams. They are very thin, and no leſs brittle.* 20

21. *Pholas* VIRGINIANA. *Liſt.* H. C. l. 3. Tab. 434. fig. 277. 21

This is as thin as the laſt, tho much larger, viz. *One which Mr* Parke *brought me from* Virginia, *was 5 inches and a half long, and 2 croſs the hinge broad, yet weigh'd not quite* ʒß. *This has the internal cardos hanging like the* *laſt, but herein it chiefly differs, that it's lunular* Murices *ar much larger, and in the place where the outer hinge was perforated, this is ſupplied by one channel.*

22 22. *Pholas* CAROLIN. e capite tantum muricatus, cardine ferè bidente. *Nob.* an *Pholas* albus anguſtus ad dimidium fere dorſi lævis *Liſt.* H.C. l. 3. Tab. 431. *Fig.* 274? *Whoſe name better agrees with this Shell than the magnitude of its* Figure; *this has no lappet, as had the two laſt, but inſtead thereof a double-toothed hinge, which lies much nearer the end than either of the aforegoing, from which part for near one third, the outer Shell is guarded with 6 or 8 more elevated lines than the reſt of the Shell, whoſe other* Striæ *are thicker ſet, and very little; by which, and its ſmallneſs, it's from the others eaſily diſtinguiſhable, the largeſt Valve I have yet met with wants of 2 inches in length, and exceeds not* ¾ *where broadeſt, and weighs but* 15 *grains.*

23 23. *Pinna* CAROLIN. maxima, lata, muricibus plurimis lunulatis. *Dr* Liſter *has given a very exact* Figure *both for ſhape and magnitude of this elegant* Shell, Tab. 372. Fig. 213. *A Valve of which* Major Halſtead *brought me from* Carolina; *it's very large*, viz. 9 *inches long, and* 5 *where broadeſt, yet weighs but* 2 *ounces and* ¼, *being very thin and brittle, theſe lunular protuberances hold a ſort of circular or faſciated order, and at the ſame a ſtriated one alſo, theſe decay, as moſt others of this kind do where they approach the tip or hinge; the outer Coat of this is apt to peel off, which under it diſcovers a dark ſhining* Mother of Pearl, *like that within, and only the remains of the exterior pertuberances are to be ſeen: I have lately received a* Mediterranean *one from* Father Bonanni *at* Rome, *much reſembling this, yet in ſome particulars differing, which I may have occaſion ſuddenly to ſhew.*

24 24. *Pinna* CAROL. minor prætenuis, tubulis lunuliſque majoribus armata. *This is leſſer and thinner than the laſt, it's externally piped towards the Mouth, and above theſe lunulated, they are thinner ſet, as the* Striæ *are; brought me by the ſame hand with the laſt.*

25. *Pinna* CAROL. craſſior, ſulcata. 25
This is apt to peel as No 23. *eſpecially the dead Shells, what its outward coat may be I am yet to learn.* Madam Williams, *from whom I received this, will I hope by the next ſend me them entire, and then I ſhall be the better able to ſay more of them.*

Sect. III. The following are ſingle Shells.

26. *Patella* lingualis CAROL. major læviſ. *an* Patella craſſa, maculis exiguis rufis diſtincta *Liſt.* H. C. l. 4. S. 1. Tab. 545. fig. 33? *The firſt and largeſt of this kind was ſeveral years ſince given me by* Mrs Danſon, *who told me ſhe had it from the* Weſt Indies, *and I believe from her Father* Mr John Archdale, *my very good Friend, who was then* Governour *of* Carolina, *and I am the rather inclined to believe it, becauſe* Madam Williams *has now ſent me ſeveral of the ſame, tho leſs, from that place.* 26

I add Lingualis *to this ſort of* Patella (*till others give it a better* Epithet) *to diſtinguiſh it from the common ſorts, becauſe this has a Tongue-like* interſepimentum *almoſt covering half the inſide of the Shell, reſembling the head of a* Canow. B. N.

27. *Patella* lingualis CAROL. compreſſa. 27
an *Patella* alba compreſſa lævis L. H. C. l. 4. S. 1. Tab. 545. Fig. 27?

This is a leſſer and much flatter Shell than the laſt, and the Tongue more elevated; I have obſerved this with ſome Ballani *ſticking to a large* Heteroſtrophon Shell *brought me from the* Iſland of Triſs *in the* Weſt Indies.

28. *Cochlea* CAROL. aurita, faſciis catenatis nigricantibus, undis fuſcis interpoſitis. *an* C. fuſca, cujus lineas ſpirales aliquot albicantes interſecant characteres quidam nigri L. H. C. l. 4. S. 5. Tab. 560. Fig. 4. operculo ejus ſtriato? *an* Rumph. *Tab.* 19. Fig. 5? The Welſh-pot Shell. *The faireſt and largeſt I ever yet ſaw, my hearty Friend* Mr Edm. Bohun *brought me from* Carolina, *it weigh'd above* 5 *drams,* 28

whereas the common ſize weigh not two ; its ſpots and waves very much reſembles the colours on the common Welſh-ware or Pots.

29 29. *Cochlea* CAROL. aure magno, fuſco.

This is diſtinguiſht from all others I have yet met with, by the largeneſs of its Ear, *viz. a protuberance reſembling that part, in the* Navel of the Shell, *which in all live ones ſhew that part more or leſs brown, the biggeſt I have yet met with weigh'd near* ʒvi ; *the common ſize about half the weight.*

30 30. *Perſicoides* CAROL. claviculâ, gyrâ altè inciſâ.

The Shell moſt nearly reſembling this in all Dr Liſter's Hiſtory *is* Figur'd *in his* 4th Book and 13th Section, No 1. *were it not that the* Clavicula *of ours is much flatter and ſhorter, with a deep indented coyl.*

31 31. *Buccinum* CAROLIN. (an *fluviatile*) ovale.

I found this Shell amongſt ſome Foſſils, &c. *which my curious Friend* Mr Job Lord *ſent me not long ſince from* Carolina ; *the ſame* Dr Liſter, *my worthy Patron, gave me ſome years ſince, with the proofs of two new* Plates *to his* Appendix ad Hiſtor. Conchyl. *in one of which he hath* Figured *it with this inſcription*, of his own writing, *è Flumine* CAROLINÆ.

32 32. *Buccinum* CAROL. ampullaceum, ſtriis caſtaneis, faſciis muricatis, majus.

Dr Liſter *has given a* Figure, Tab. 880. *which ſeems very much to repreſent this, excepting that his* Murices *are not ſo large as ours ; perhaps the Shell from whence he took his* Figure *might have them worn off, yet ſometimes in theſe bigger Shells you may obſerve them threefold, one diſtinctly over the other, which caſing is alſo ſeen on the right lip of the Shell, as the* Dr's Figure *has very well obſerved : Whether theſe be annual protruſions or growths, I dare not yet determine. The largeſt of this kind I have yet met with, abated but* ℥j *of a pound.*

33 33. *Buccinum* CAROL. ampullaceum ſtriis caſtaneis, faſciis muricatis minus.

In one of the Editions of Dr Liſter *his* curious Hiſtory of Shells, *Lib.* 4. Sect. 13. *he has given an* Accurate Figure *of this ſmaller ſort, under* Cap. 1. De Buccinis ampullaceis lævibus aut certe minus aſperis, *and indeed while theſe are young they may deſerve that character; amongſt ſeveral Mad.* Williams *ſent me of divers magnitudes, the leaſt was the moſt beautiful Shell, its baſis white, the edge of each Coat ſhaded with brown, having a white girdle croſs the middle of the upper orb or round: This weighs but* ʒij, *and I have traced them to be the ſame even to the laſt, which weigh'd near a pound. I obſerve the largeſt to be leſs beautiful, which may proceed from their age and decay.*

34. *Buccinum* ampullaceum ſtrijs Caſtaneis, faſcijs muricatis majus heteroſtrophon, *ex Inſula Triſſ.* 34

This differs from the next no otherwiſe than No 32 did from the laſt, viz. *in bigneſs, for that reaſon I inſert it here, tho I have as yet received it from the* Iſland of Triſs *only, from whence it was brought me by my Kind Friend* Mr Fiteild, Surgeon, *now living at* Rumford *in* Eſſex: Dr Liſter *confirms me alſo in my opinion, by giving a* Figure *of this great ſort,* Tab. 908. N 28. *and ſays it's the ſame with the leſs,* viz. *the next, this weighs one pound and near 3 qrs.*

35. *Buccinum* CAMPEACHIANUM ampullaceum, ſtrijs Caſtaneis faſcijs muricatis, minus, heteroſtrophon. *Buccinum* ampull. ſtriatum muricatum item radiatim ex fuſco Liſt. H. C. l. 4. S. 13. Fig. opt. 27. Tab. 907. *To which he adds this comment,* Purpura marina exotica eaq; ſola Cochlea è Marinis eſt, quantum hactenus vidi quæ, dextra ſiniſtrorſum torquetur. *This differs nothing from* No 33. *but in the rarity of its Mouth's place, this facing the Right* hand, *whereas all other Shells (a few excepted) incline to the Left. The Reverend* Mr Stoneſtreet *firſt gave me this rare Shell, and now* Madam Williams *another, it being the only one amongſt near half a ſcore of the other-Mouth'd.* 35

Sect.

Sect. IV. *The following are* Foſſils *ſent me from thence.*

36 36. *Gloſſopetra* CAROL. maxima nigreſcens ponderoſa. *This is one of the largeſt I have yet ſeen, being above three inches from the tip to the hollow or middle of the Root; this laſt part is very large and protuberant. the Teeth black, ſmooth on the edges, but in the middle much furrow'd; the whole very weighty.*

37 37. *Gloſſopetra* CAROLIN. leviter ſerrata é nigro rubroque eleganter variegata.

This is almoſt a ſtraight Tooth i. e. *very little waving to either ſide, as moſt of them more or leſs do, its edges are rather pounc't than notch'd, from tip to the middle of the Root near an inch and half; its Toothy part is finely variegated with red and black.*

For theſe two, with ſome Foſſil Bones, *as* Vertebræ, &c. *and ſeveral other Curioſities, I am oblig'd to our ingenious Friend* Mr Job Lord, *from whom I have receiv'd ſeveral Collections; and am ſuddenly (according to advice) in expectation of more, which the Publick ſhall have an Account of, with the* Reptiles, Lizards, Inſects, *&c. which* Mad. Williams *hath alſo lately ſent me:*

II. *The*

II. *The Doctrine of Combinations and Alternations, Improv'd and Compleated, by Major* Edward Thornycroft.

IN order to underſtand what follows, it muſt be obſerved,

1ſt, That as in the notation of Powers, a a a a b b b c c is deſign'd by $a^4 b^3 c^2$, and univerſally p times the poſition of a, q times the poſition of b, r times the poſition of c, by $a^p b^q c^r$, ſo in things expos'd likewiſe: (unleſs where 'tis propos'd they ſhould be all different) which Indices, as they have here no relation to Powers, but expreſs only the Occurrences of thoſe things to which they reſpectively belong; I therefore call Indices of Occurrences.

2dly, That as often as I ſhall hereafter mention the Combinations or Alternations of the p^s q^s r^s or s^s, (which conſider'd by themſelves are capable of no variation) I mean of thoſe things whoſe Indices they are.

3dly, That m is generally put for the whole number of things expos'd, whether all different or not, *i. e.* equal to the ſum of their Indices; and n, for ſuch a number of them, as each Combination and Alternation muſt conſiſt of; (unleſs preſuppoſed equal) which explains what is hereafter meant by the Combinations and Alternations of m things taken n and n; or of m things taken m and m; and the like Expreſſion, by whatever Symbols the number of things out of which the Combinations and Alternations are to be made, or of which they are to conſiſt, may be deſign'd.

Lemma 1ſt.

If in a right Line, at any diſtances, be plac'd any number of things, a b c d, *&c.* the number of the Intervals a b; b c, c d, *&c.* terminated each by two adjacent things, is one leſs than the number of things.

For, whereas every Interval is terminated by two adjacent things, if to any number of things, be added one thing more, one Interval only is thereby added. Q. E. D.

Lemma 2d.

The number of the Alternations of m things a b c d, *&c.* different each from other, taken m and m, is m times the number of the Alternations of m—1 things a b c, taken m—1 and m—1.

For, (by *Lem.* 1ſt) the laſt Letter d, beſides the poſition it hath, may have m—2 poſitions, *viz.* in the Intervals which are between m—1 things a b c; but it may alſo have one more, for it may be put firſt of all, it may therefore have m poſitions; and thoſe in all the different Orders, whereof m—1 things are capable; which being all the poſſible poſitions of d, in all the varieties of a b c, is all the variety whereof the whole number of things expoſed a b c d, *&c.* is capable. Q. E. D.

Lemma 3d.

The number of the Alternations of m things a b c d, *&c.* different each from other, taken m and m, is equal to $m \times \overline{m-1} \times m\, \overline{m-2} \times \overline{m-3} \times \overline{m-4}$, *&c.* continu'd to m places.

For let m O, expreſs the number of the Alternations of m things different each from other; $\overline{m-1}\ O$, of m—1 things and the like.

'Tis evident that if m = 1, It will be m O = m; for there can be but one order of one thing.

And if m be greater than unity, then will it be (by *Lem.* 2)
$m\,O = m \times \overline{m-1}\,O = m \times \overline{m-1} \times \overline{m-2}\,O = m \times \overline{m-1} \times$
$\overline{m-2}$

$\overline{m-2} \times \overline{m-3}\; O =$, *&c.* till we have an Equation conſiſting of m places; *i. e.* $= m \times m-1 \times m-2 \times m-3 \times$ *&c.* continu'd to m places. Q. E D.

Lemma 4th.

If $m\,\omega$ Expreſs the number of the Alternations of m things $a^p\, b^p\, c^p\, d^q\, e^q\, f^r$ *&c.* taken m and m, and α the number of p^s, β the number of q^s, γ the number of r^s, *it* will be

$$m\,\omega = \frac{m \times m-1 \times m-2 \times m-3 \times m-4 \times m-5 \times \&c. \text{ continu'd to m places.}}{\overline{p \times p-1 \times p-2 \times \&c.}^{\,\alpha} \times \overline{q \times q-1 \times \&c.}^{\,\beta} \times \overline{r \times r-1 \times \&c.}^{\,\gamma}}$$ each Series continued to p, q, r, *&c.* places reſpectively.

For the number of the Alternations of any number of things, however divided into parts, is produc'd by a continual Multiplication of the Alternations of thoſe things amongſt themſelves reſpectively, which compoſe each part, into the number of their Alternations one amongſt the other; *i. e.* in the preſent caſe (the ſeveral occurrences being ſuppoſed to compoſe the ſeveral parts, and conſequently the number of the Alternations of the things compoſing each part equal to unity) $m\,\omega =$ to the number of the Alternations of the things compoſing the parts one amongſt the other; but the number of their Alternations one amongſt the other, is the ſame in this caſe, as if the things expos'd, being all different, were divided into the ſame parts; for the things which compoſe each part in both caſes, are different from the reſt of the things expos'd; *i. e.* by *Lem.* 3d.

$$m\,\omega = \frac{m \times m-1 \times m-2 \times m-3 \times m-4 \times m-5 \times \&c. \text{ continued to m places}}{\overline{p \times p-1 \times p-2 \times \&c.}\,|^{\alpha} \times \overline{q \times q-1 \times \&c.}\,|^{\beta} \times \overline{r \times r-1 \times \&c.}\,|^{\gamma}}$$ each Series continued to p, q, r places reſpectively. Q. E. D.

Lemma 5th.

The number of the Combinations of m things a b c d, *&c.* different each from other, taken n and n, is equal to $\frac{m \times m-1 \times m-2 \times m-3 \times \&c.}{n \times n-1 \times n-2 \times n-3 \times \&c.}$ each Series continued to n places.

For if the things expos'd be divided in two parts, *viz.* in the *ratio* of n and m—n, 'tis evident that their different binations taken n and n, are produc'd by the Alternations of the things compoſing the parts one amongſt the other: And therefore the number of thoſe = to the number of theſe = to the number of the Alternations of m things taken m and m, the Indices of whoſe occurrences are n and m—n $= \frac{m \times m-1 \times m-2 \times m-3 \times \&c. \text{ continued to m places}}{n \times n-1 \times \&c. \times m-n \times m-n-1 \times \&c. \text{ each Series continued to n and m−n}}$ places reſpectively (by *Lem.* 4th) *i. e.* becauſe n + m—n = m $= \frac{m \times m-1 \times m-2 \times m-3 \ \&c.}{n \times n-1 \times n-2 \times n-3 \ \&c.}$ each Series continued to n places Q. E. D.

But the number of the Alternations in every Combination is = n × n — 1 × n — 2 × n — 3 ×, *&c.* continued to n places, by *Lem.* 3d therefore.

Lemma 6th.

The number of the Alternations of m things a b c d, *&c.* different each from other, taken n and n, is = m × m — 1 × m — 2 × m — 3 ×, *&c.* continued to n places. Q. E. D.

Scholium.

Since in the things expos'd the ſame things may occur more than once, and alſo n be leſs than m, the Indices of the occurrences which are in ſome of the Combinations of m things taken n and n, may differ from thoſe which are in others; but thoſe Combinations, the Indices of whoſe occurrences are the ſame, are ſaid to be in the ſame form: Therefore whereas n is equal to the ſum of the Indices which are in each Combination taken n and n, if n be expreſs'd by all the different Combinations of ſuch Indices only (being integer numbers) whereof no one may exceed the higheſt Index of the things expos'd, and being more than one in a Combination, are each of them, which are in the ſame Combination, comprehended in a diſtinct Index thereof; theſe Expreſſions of n will neceſſarily be the ſeveral forms of the Combinations taken n and n, whereof m things are capable: Whence is deriv'd a General

The

Theorem for finding the Combinations and Alternations of m things taked n and n univerſally: *i. e.* Whether m conſiſt of things all different or not, and whether n be equal to, or leſs than m.

Theorem.

If n be expreſs'd, according to all the different Forms of Combination which the things expos'd are capable of,

and $\left\{\begin{array}{l} p = \text{the higheſt Index} \\ q = \text{the next higheſt} \\ r = \text{the next higheſt} \\ ſ = \text{the next higheſt} \end{array}\right\} \left\{\begin{array}{l} \alpha = \text{the number of p}^s \\ \beta = \text{the number of q}^s \\ \gamma = \text{the number of r}^s \\ \delta = \text{the number of ſ}^s \end{array}\right\}$ In every form of Combination.

&c.

$\left\{\begin{array}{l} A = \text{the number of all Indices not leſs than p} \\ B = \text{the number of all Indices not leſs than q} \\ C = \text{the number of all Indices not leſs than r} \\ D = \text{the number of all Indices not leſs than ſ} \end{array}\right\}$ Which are in the things Expos'd

&c.

and $b = \alpha + \beta$, $c = b + \gamma$, $d = c + \delta$, *&c.*

I ſay the number of the Combinations of m things taken n and n, in any one Form of Combination, ſhall be

$$\frac{A \times A-1 \times A-2 \text{ \&c.}}{\alpha \times \alpha-1 \times \alpha-2 \text{ \&c.}} \times \frac{B-\alpha \times B-\alpha-1}{\beta \times \beta-1} \times \text{\&c.} \times \frac{C-b \times C-b-1}{\gamma \times \gamma-1} \times \text{\&c.} \times \frac{D-c \times D-c-1}{\delta \times \delta-1} \text{ \&c.}$$

continued to ſo many Terms as there are different Indices in the form of Combination and each Term to α, β, γ, δ, *&c.* places reſpectively, and this number multiply'd into

$$\frac{\times n-1 \times n-2 \times n-3 \times n-4 \times n-4 \times n-5 \times n-6 \text{ \&c. continued to n places,}}{\overline{p \times p-1 \times p-2 \times \text{\&c.}}|^{\alpha} \times \overline{q \times q-1 \times \text{\&c.}}|^{\beta} \times \overline{r \times r-1 \times \text{\&c.}}|^{\gamma} \times \text{\&c.}}$$

each Series continued to p, q, r, *&c.* places reſpectively, ſhall be the number of their Alternations.

But the ſum of all the Combinations and Alternations which are in every Form of n ſhall be the whole number of Combinations and Alternations of m things taken n and n.

Demonſtration.

Firſt, Then 'tis evident, that thoſe Combinations, which are in different forms, differ from each other.

Again, 'Tis evident that the Combinations of m things, as $a^p\ b^p\ c^p\ d^p\ e^q\ f^q\ g^q\ h^r\ i^r$, *&c.* (the Indices ſimply conſider'd) taken n and n, in a form wherein are p^s q^s and r^s, ſhall be equal to the number of the Combinations of the p^s, which are in the things expos'd, taken α and α, multiply'd into the number of the Combinations of the q^s taken β and β multiply'd into the number of the Combinations of the r^s taken γ and γ.

But becauſe p and all leſſer Indices are comprehended in every Index which is greater than themſelves; therefore is A = to the number of p^s which are in the things expos'd, and for the ſame reaſon, would B = the number of the q^s, and C the number of r^s: But the number of the p^s, which are in every form of Combination, is = α; therefore is B — α = to the number of q^s; alſo becauſe the number of p^s and q^s together, which are in every form of Combination, wherein there are q^s, is = $\alpha + \beta = b$; therefore is C — b = to the number of r^s, and ſo on, how many ſoever were the different Indices in any form of Combination.

But (by *Lem.* 5th) the number of the Combinations of the p^s, which are in the things expos'd, whoſe number is A, taken α and α, is = $\frac{A \times A - 1 \times A - 2}{\alpha \times \alpha - 1 \times \alpha - 2}$ *&c.* continu'd to α places, and the number of the Combinations of the q^s, whoſe number is B—α, taken β and β, is = $\frac{B - \alpha \times B - \alpha - 1}{\beta \times \beta - 1}$ $\frac{\times B - \alpha - 2}{\times \beta - 2}$ *&c.* continued to β places; and the number of the Combinations of the r^s, whoſe number is C — b, taken γ and γ, is = $\frac{C - b \times C - b - 1}{\gamma \times \gamma - 1}$ *&c.* continued to γ places Q. E. D.

But every Combination, in one and the ſame form, affords the ſame number of Alternations: Therefore the number of Alternations, in any one form, is ſo many times the number of Combinations, as is the number of Alternations in any one of theſe Combinations.

But (by *Lem* 4th) the number of Alternations in any of thoſe Combinations ſhall be

$$\frac{n \times \overline{n-1} \times \overline{n-2} \times \overline{n-3} \times \overline{n-4} + \overline{n-5} \times \overline{n-6} \times \&c, \text{ continued to } n \text{ places}}{\overline{p \times p-1 \times p-2 \times \&c.}|^{\alpha} \times \overline{q \times q-2 \times \&c.}|^{\beta} \times \overline{r \times r-1 \times \&c.}|^{\gamma} \times} \text{ each Series continued to } p\ q\ r\ \&c.$$

places reſpectively. Q. E. D.

Now to make an application of this general Rule to thoſe particular caſes which have already been conſider'd by others, and which are contain'd in our 3d, 4th, 5th and 6th *Lemma's*, and by us more generally demonſtrated; I ſay

If n = m, there can be but one form of Combination, and but one Combination in that form; and therefore the number of Alternations $= \dfrac{m \times \overline{m-1} \times \overline{m-2} \times \overline{m-3} \times \overline{m-4} \times \&c. \text{ contin'd to } m \text{ places}}{\overline{p \times p-1 \times \&c.}|^{\alpha} \times \overline{q \times q-1 \times \&c.}|^{\beta} \times \overline{r \times \&c}|^{\gamma} \times}$ *&c.* each Series to p q r, *&c.* places reſpectively, *i. e.* (if p = 1) = $m \times \overline{m-1} \times \overline{m-2} \times \overline{m-3} \times \overline{m-4} \times$ *&c.* continu'd to m places, which are the caſes of the 4th and 3d *Lemma's*.

But if the things expos'd are all different, and n be leſs than m, which is the caſe of the 5th and 6th *Lemma's*, then alſo can there be but one form of Combination, and it will be A = m & α = n, and the whole number of Combinations $= \dfrac{A \times \overline{A-1} \times \overline{A-2} \times \&c.}{\alpha \times \overline{\alpha-1} \times \overline{\alpha-2} \times \&c.}$ *i. e.* $= \dfrac{m \times \overline{m-1} \times \overline{m-2} \times \&c}{n \times \overline{n-1} \times \overline{n-2} \times \&c}$ each Series continued to n places, and therefore the number of Alternations = $m \times \overline{m-1} \times \overline{m-2} \times$ *&c.* continu'd to n places.

But fully to Illuſtrate this Theorem, which, as deliver'd in general, may ſeem ſomewhat too Abſtracted, to be commonly underſtood, I ſhall ſubjoyn one ſhort Example.

Example.

Let the things expoſ'd be a a a b b b c c, or according to our way of notation $a^3\ b^3\ c^2$; 'Tis requir'd to find the number of their Combinations and Alternations taken 4 and 4.

Then (becauſe in the things expoſ'd, there is no one thing occurs more than thrice, nor more than three things different from each other) will all the forms of Combination, which the things expoſ'd are capable of, be theſe,

$$\textit{viz.}\ \left\{\begin{matrix}3\ .\ 1\\ 2\ .\ 2\\ 2\ .\ 1\ .\ 1\end{matrix}\right\}\text{Then}$$

In the 1ſt form will $p=3$, $q=1$, $\alpha=1$, $\beta=1$, $A=2$, $B=3$
In the 2d form will $p=2$, ——, $\alpha=2$, ——, $A=3$, ——
In the 3d form will $p=2$, $q=1$, $\alpha=1$, $\beta=2$, $A=3$, $B=3$

The number of Combinations in the 1ſt form $=\frac{A}{\alpha}\times\frac{B-\alpha}{\beta}=\frac{2}{1}\times\frac{2}{1}=4$

The number of Combinations in the ſecond form $=\frac{A\times\overline{A-1}}{\alpha\times\overline{\alpha-1}}=\frac{3\times2}{2\times1}=3$

The number of Combinations in the 3d form $=\frac{A}{\alpha}\times\frac{B-\alpha\times\overline{B-\alpha-1}}{\beta\times\overline{\beta-1}}=\frac{2\times1}{2\times1}=3$

And the whole number of Combinations $=10$

Alſo the number of Alternations.

In the 1ſt form $=4\times\frac{\overline{n\times n-1\times n-2\times n-3}}{\overline{p\times p-1\times p-2}|^{\alpha}\times q^{\beta}}=4\times\frac{\overline{4\times3\times2\times1}}{\overline{3\times2\times1}|^{1}\times}=4\times4=16$

In the 2d form $=3\times\frac{\overline{n\times n-1\times n-2\times n-3}}{\overline{p\times p-1}|^{\alpha}}=4\times\frac{\overline{4\times3\times2\times1}}{\overline{2\times1}|^{2}}=3\times6=18$

In the 3d form $=3\times\frac{\overline{n\times n-1\times n-2\times n-3}}{\overline{p\times p-1}|^{\alpha}\times q^{\beta}}=3\times\frac{\overline{4\times3\times2\times1}}{\overline{2\times1}|^{1}\times1^{2}}=3\times12=36$

And the whole number of Alternations $=70$

Many are the Properties of this *Theorem*, in common with others, as, To find the *Unciæ* of a Multinomial rais'd to any integer power. To raiſe an Infinite Series to an integer power, though of an interrupted Order, without introducing any thing immaterial, or which muſt afterwards be expung'd; and many others. But then ſo many Terms of the Series muſt be taken in at firſt as ſhall ſerve to the purpoſes of the intended approximation, otherwiſe as often as it ſhall fall ſhort of that, the Operation muſt be began *de novo.*

Many likewiſe are the Properties peculiar to this *Theorem*, and great Variety of Problems might be fram'd; and I ſcruple not to ſay, many may occur in Practice, which are ſolvable by this, and no other Method whatever.

Hence may be found the number of Words whereof the 24 Letters are capable, from one Letter in each Word, to any number of Letters given.

Hence may be found the number of all Numbers, to any given number of Places, which may be produc'd from any number of Figures given.

Hence alſo the Compaſs of a Muſical Inſtrument being given, the Time and number of the Bars, whereof each Tune ſhall conſiſt, the number of Tunes may be found which that Inſtrument is capable of.

To give an inſtance of the prodigious variety that there is in Muſick, I have Calculated the number of Tunes in Common Time, conſiſting of eight Bars each, which may be play'd on an Inſtrument of one Note Compaſs only, and it is this, *viz.* 27584. 270157: 013570. 368586. 999728. 299176. whereas the Changes on 24 Bells is but 620448. 401733. 239439. 360000, which is but $\frac{1}{444588.\ 604583}$ of the number of Tunes, and yet Dr *Wallis* in his *Algebra* demonſtrates, could not be diſpatch'd in 31557. 600000. 000000 years.

If then the Inſtrument were of as many Notes Compaſs as any Inſtrument now in uſe, how prodigiouſly muſt the number of Tunes be encereas'd; the Calculation of which (tho much more intricate and operoſe) would be equally attainable by our Theorem.

III. *Of Oſſifications or Petrifactions in the Coats of Arteries, particularly in the Valves of the Great Artery, by* William Cowper, *Surgeon, and F. R. S.*

HOw far Anatomical Enquiries inform in the true cauſes of Diſeaſes, which have been aſcribed to the want of Spirits in ſome, and Radical Moiſture in Aged People, *&c.* may be in ſome meaſure ſeen by two Obſervations, among others, publiſht in the Tranſactions No 280: The firſt there mentioned, pag. 1195, is of a young Gentlewoman, in whom the *Parietes*, or Membranes, that compoſe the Trunks of the Arteries of the Arm near the *Axilla*, being very much thickened, ſo that the *Diameter* of its Bore was leſſened to more than a third part of its natural ſize; inſomuch that a part of the Trunk of the Artery cut Tranſverſel very much reſembled a bit of the ſtem of a Tobacco-pipe, its ſides were ſo thick, and its Bore conſequently ſo much leſſened: The other was of the Trunks of the Arteries of the Leg, pag. *ib.* that were Obſtructed by Petrifactions or Oſſifications, in a perſon about the 67th year of his Age. Since which I have met with ſeveral of the like Inſtances in people of years, particularly in the Leg of an old Gentleman, whoſe Toes and Foot were Sphacelated, the Arteries of whoſe Leg I have ſtill by me, and have ſent them herewith Injected, as much as they could be, with Red Wax; in which the Oſſifications diminiſhing their Channels in ſome places, and totally obſtructing them in others, is made very evident. (See the Preparation in the *Repoſitory* of the *Royal Society.*)

The Diſſections of Morbid Bodies not only inſtruct us in the Seats and Cauſes of Diſeaſes, but very often inform us in the true Uſe of parts, as will appear by the following Inſtances.

The Oſſification or Petrification in the Great Artery, at its riſe from the Heart, has been ſo commonly found, that ſome think it is conſtant; how it may be in ſome Animals I cannot be certain, but in Humane Bodies I am well aſſured whenever it happens it is a Diſeaſe, and does in ſome meaſure incommode thoſe parts in the due execution of their office, as the following Caſes will evidence: But that this Paper may be of ſome uſe, I ſhall ſet down the Symptoms before Death, which may help our Conjectures when the like offers again. A ſpare man about 30, who languiſht with an Ulcer in the Thigh, attended with a *Caries*, or Rottenneſs of that Bone at its Articulation with the *Tibia* and *Patella* call'd the Knee, where all thoſe Bones were affected, at length fell into a true *Phthiſis*, and coughed up no ſmall quantity of *Pus*; ſome months before his Death I frequently ſaw him, when he would often offer me his Wriſt, to feel his unequal Pulſe, which was wont to amuſe him; the Artery there miſſing ſometimes one, ſometimes two ſtrokes in 6 or 7: At firſt he told me he obſerved it miſt but one in ten but at length thoſe ſtops became more frequent, eſpecially on any agitation of the Body or Mind: tho a *Polypus* in any of the Great Veſſels about the Heart may induce that Symptom, yet the continuance of it ſo long before Death, ſhews it owing to ſome other Cauſe, as appear'd on opening the Heart and Great Artery of this perſon. A A A D G. Fig. 1ſt.

You will not be ſurprized I ſend the Figures printed from Copper Plates, when I tell you they are deſigned, among others (I am now about) to explain the Muſcles,

in

in another Edition of my *Myotomia Reformata*, this Fig. the 1ſt being one of thoſe that repreſent the Muſcular Structure of the Heart; the reſt I have added to explain the Petrifaction of the Valves of the *Aorta* in the following inſtance.

Fig. 1.

A A. The Trunk of the Great Artery opened and diſplay'd.

a a a. The three Semilunary Valves of the *Aorta*, which hinder the Blood from returning to the Heatt,after it is expell'd thence by its *Syſtole* or Contraction; theſe Valves in this caſe were ſomewhat thicker, and not ſo plyable as naturally, and did not ſo adequately apply to each other, as is expreſt Fig. 4. a a a. Whence it hapned ſometimes, that the Blood in the Great Artery (A A A. Fig. 1.) would recoil, and interrupt the Heart in its *Syſtole.* But this ſtubbornneſs of theſe Valves was owing to a Bony or ſtony body, markt b. Fig. 1ſt, which appear'd much plainer when the Valves were dry, as is repreſented in the Figure beneath, markt with an *: a a. the two Valves pinn'd out and dry'd, b the Petrifaction or ſtony Body at their junction. In this Inſtance I obſerv'd the Left Ventricle of the Heart, expreſt at G G. D D. e e. f f. Fig. 1ſt, to be a little dilated from its natural ſize, but was not by two parts in three ſo big as the Left Ventricle of the Heart of one I diſſected in the Preſence of Dr *Sloane.* The Symptoms, ſome years before the Death of this perſon, who was about 40 years of Age, were extraordinary Shortneſs of Breath, eſpecially on any fatigue, with an intermiſſion of one ſtroke in three of the Pulſe; his poſture of ſitting up was more Eligible than any other, he complain'd of great faintneſs,and now and then pain about the Heart; the extreme parts often cold, which towards his Death increaſed more and more on him; his Legs and Arms being Gangreen'd ſome hours before; inſomuch that the Corps was very offenſive in opening, tho 'twas done within 24 hours after he expired, in the month of *November.*

Upon opening the Cheſt, the Heart, particularly its Left Ventricle, was found larger than that of an ordinary Ox, and fill'd with Coagulated Blood. The Valves of the Great Artery A A. Fig. 1. were Petrify'd, inſomuch that they could not approach each other, as expreſt Fig 2. and 4. But an Orifice, repreſented at Fig. 5, remain'd always open by the Petrifactions b b, Fig. 3. and a a, Fig. 5, which had clogg'd theſe Valves, and hindered their application to each other, as in a Natural ſtate is repreſented in Fig. 2 and 4, a a a.

The explication of the Symptoms in both theſe Caſes is obvious enough; for tho the Perſon firſt inſtanced did not dye of the ſame diſeaſe with the laſt mentioned, yet the Symptoms in his Illneſs plainly ſhewed what muſt follow, from the diſorders of theſe *Valves*, as they are rendred more or leſs uſeleſs: For as their Office is to prevent the return of the Blood into the Heart, in its *Diaſtole*, by exactly ſhutting up the paſſage of the *Aorta* (as the Flaps in Water Engines) ſo if by any accident they are hinder'd from doing their duty, as they were by the Petrifactions mentioned, the conſequences muſt be, not only a regurgitation of Blood into the Heart, but they baulk its impulſive force, when the Muſcular Fibres (which are in theſe Valves) cannot contract to prepare the paſſage for the Blood of the Left Ventricle, when to be expelled into the *Aorta*. Hence the Intermiſſions of the Pulſe in the firſt inſtance may be accounted for. In the latter inſtance, theſe Valves were wholly uſeleſs, the Circulation became more difficult, as appear'd by the refrigeration of the extreme parts, Gangreens, *&c.* In both theſe caſes the Left Venticle of the Heart was dilated proportionably to the ill conſtitution of theſe Valves, which clearly ſhews theſe Valves give that aſſiſtance to the Heart in its Office that it cannot be without, and that it gradually ſuffers according to their indiſpoſition.

Before theſe Papers were ſent to the Preſs, I had an opportunity of obſerving a like Inſtance of that firſt mention'd in this latter part of them. It was an Elderly Gentleman, about 72, who had ſometimes Intermiſſions in his Pulſe ſeveral years before his death, in whom I found divers Petrifications in the Mitral and Semilunary Valves of the Left Ventricle of the Heart.

If my time would give leave, I might here add ſome Anatomical remarks on the Structure and Mechaniſm of this noble Organ, particularly of the Uſe of that Tranſverſe Tendon expreſt at f f. Fig. 1. and the Progreſs and Inſertions of the Tendons f. Fig. 3, ariſing from the *Carneæ Columnæ* e e, which do not all terminate in the lower Margin of the Mitral Valve d, Fig. 2 and 3, but paſs to the upper and middle part of that Valve, whilſt others terminate in the Baſis of the Heart, with the Muſcular ſtructure of the Semilunary Valves; but theſe I muſt reſerve for another place.

The Explanation of the Figures.

Fig. 1.

The Left Ventricle of the Heart open'd, *&c.*

AAA. The inſide of the *Aorta* ſlit open to the Left Ventricle.

BB. The Bulbous Trunk of the *Vena Pulmonalis* divided through, and pinn'd aſide to ſhew

a a a. The three Semilunary Valves of the *Aorta*, which hinder the Blood from returning to the Heart.

b. A ſmall Stony Body at the conjunction of two of the Semilunary Valves, expreſt at the * below this Figure.

a a. Parts of the two Valves dryed.

b. The Petrifaction, as it appears in the dryed Valves.

C. Part of the lower Trunk of the *Vena Cava*, cut off immediately above the Liver.

c c c. The Left Auricle open'd and pinn'd out.

D D. The

D D The ſides of the Left Ventricle divided and drawn aſide, to ſhew its inſide d d e e f f G G.

d d. The Mitral Valves of the Left Ventricle of the Heart or *Arteria Pulmonica* divided and turn'd aſide.

e e. The *Carneæ Columnæ*, whence ſpring the Tendons faſten'd to the Valves, d d, expreſt Fig. 3. d f.

f f. A Tranſverſe Cord or Tendon, by which the *Columnæ Carneæ* are drawn nearer each other in the *Syſtole*, or contraction of the Heart, when the Blood is expell'd into the *Aorta*; whereby the Tendons (expreſs'd f f Fig: 3 and 5) draw the Mitral Valve laterally; by which means its Orifice g c. Fig. *ibid*, is not only cloſed to prevent the return of the Blood by the *VenaPulmonalis*, but at the ſame time it opens a paſſage for the Blood of the *Arteria Magna*, by withdrawing the Mitral Valve, d Fig. 2. from the Orifice of the *Aorta*, a a a g. Tho this Artifice in Nature may be indifferently explain'd by theſe Figures; yet I have deſign'd ſome others, that I think will make it more intellegible in another place.

G G. The Internal Surface of the Left Ventricle where it is ſomewhat ſmoother as it leads to the *Aorta*.

g g. The Trunk of the Coronary Vein divided when filled with Wax.

h h. The Coronary Artery in like manner divided.

i. One of the Trunks of the *Vena Pulmonalis*.

k k k. The three Orifices of the Trunks of the *Vena Pulmonalis*, as they open into the Bulbous Trunk, expreſs'd at B B.

H. The Cone of the Heart.

Fig. 2

A. Part of the *Aorta* next the Heart.

a a a. The three Semiluminary Valves, as they appear next the Heart in a Natural State, when the Heart is in *Diaſtole*, and the Blood hinder'd by theſe Valves from returning to its Left Ventricle.

b b. Part of the Baſis of the Heart cut off.

c c. The two *Calumnæ Cornea* of the Left Ventricle.

d. The Mitral Valve.

f f. The Tendons Springing from the *Carneæ Columnæ*, and inſerted into the upper and middle parts of the Valve, as well as to its lower Margin; which is better expreſt in the following Figure.

g. The Orifice of the *Aorta* compleatly cloſ'd by the application of theſe three Valves to each other.

Fig. 3.

Shewsthe ſame parts expreſt in the preceding Figure, as they appear'd when the Valves of the *Aorta* were Petrified: The ſame Letters alſo directing to the parts already explain'd, except a.

a. Part of one of the Valves which was not cover'd with the Petrifaction.

b b b. The Petrifactions on the reſt of the Valves.

† A ſmall Petrifaction on the Mitral Valve:

h h h. Some of the Tranſverſe Tendons which draw the *Carneæ Columnæ* to each other, when the Heart is in *Syſtole*, for the more effectual cloſing the Orifice of the Mitral Valve, expreſt here at g.

Fig. 4 *and* 5,

Shews the ſame parts repreſented in the two preceding Figures, as they appear view'd towards the Heart, when dry'd and diſplay'd.

A A. The Trunk of the *Aorta*.

a a a. Fig. 4. The Semilunary Valves in a Natural State, when the Blood in the Arteries preſſes them cloſe to each other.

b b b b. The Trunks of the two Coronary Arteries cut off.

a a. Fig. 5. The Semilunary Valves Petrify'd.

c. The Orifice of the Mitral Valve next the *Vena Pulmonalis*.

ddd. The Internal Surface of the Mitral Valve leading into the Left Ventricle.

eee. The *Columnæ Carneæ:*

ff. Their Tendons.

gg. The Tranſverſe Tendons which draw the Fleſhy Columns to each other when the Heart is in *Syſtole.*

IV. *An Account of a Dropſical Body diſſected by Mr* John Laſage.

SIR,

I Was called, ſome time ago, to open a Maiden Lady 52 years of age, who complain'd, about ſix weeks before, of a Circonſcript hard Swelling on the *Hypograſtica regio*, on the Right ſide; from that time her Belly grew by degrees to an exorbitant bigneſs, the great weight whereof was the moſt conſiderable Symptom, and at laſt ſuffocated the Lady. The Body was mightily emaciated, and the Legs ſwelled few days before her death.

I expected Water, but there was only a viſcuous darkiſh Humour, to the quantity of 18 Gallons; after the evacuation of that matter, I was no leſs ſurprized to perceive a large heap of Veſcicles ariſing from a thick Membrane covering the Guts, it being the *Peritoneum* ſeparated from the Muſcles: I took it out, to examine the better thoſe Veſcicular Bodies diſpoſed on the outward ſurface of that Membrane, as alſo them that were on its inſide, towards the Guts. The Veſcicles were of different magnitude; ſome of the largeſt had been broken and ſunk, others were broken and almoſt empty, and the others very much diſtended and full; the matter of all of them was of the ſame nature with the extravaſated humours. What was contained in the leſſer ones proved to be of different colour and conſiſtence, not unlike Gelly, White of Eggs, Gall, and Honey; in ſome it was much like the humour of a true *Meliceris.*

I muſt obſerve, that there was but little matter extravaſated in the Cavity of the *Abdomen*; moſt part was contained betwixt the *Peritoneum* and the Muſcles.

The Right Kidney was effected with a particular Dropſie; all the *Viſcera* beſides were in a natural ſtate, two *Polypus*'s were found in the Heart, and two pretty big Stones in the Gall Bladder.

V. *An Account of a Book, By* James Douglas, M. D. De Aure Humana Tractatus; In quo integra Auris Fabrica, multis novis Inventis, & Iconiſmis illuſtrata, deſcribitur; omniumque ejus Partium Uſus indagantur. Quibus interpoſita eſt Muſculorum Uvulæ, atque Pharyngis nova Deſcriptio, & Delineatio. Auctore Antonio Maria Valſalva Imolenſi, Philoſophiæ & Medicinæ Doctore, in Bononienſi Univerſitate ad Inciſionem & Oſtenſionem Anatomicam Profeſſore Conducto, necnon Noſocomii Incurabilium Chirurgo. Bononiæ MDCCIV. *In Quarto.*

THe Author divides the Humane Ear into three Cavities, *viz.* the External, which contains the Auricle, and the Auditory paſſage; The Middle, which comprehends the *Tympanum*, or Cavity of the Barrel, In which are the four little Bones, *&c.* And the Internal, which contains the Labyrinth, which he farther divides into the *Veſtibulum*, Semicircular Canals and *Cochlea*.

The Prominence called *Helix* ends in the Lobe of the Ear, which it conſtitutes, and that called *Anthelix* terminates in the *Antitragus*.

He gives the common Names to the Cavities that lye between the Eminencies of the Auricle, and divides the *Concha* into two Cavities, *viz.* the Superior and Inferior.

Under the Skin of the Auricle he takes notice of a great number of Glands, which, from the likeneſs of the Humour they ſeparate to that of Tallow or *Sebum*, he calls *Glandulæ Sebaceæ*: Which Liquor being carried to the ſurface of the Skin, he alledges hardens there, and turns into a ſcaly greaſie ſubſtance, much like to that of Bran.

That there are abundance of ſuch Glands under the Skin of the Head, he thinks that the greaſineſs of the Hair, and the Dandriff that's combed from the Head, may be a ſufficient proof.

The Lobe of the Ear, and the lower part of the *Helix*, are made up of a duplicature of the common Integuments, without any Cartilage: In no part of the Auricle, except in theſe two, is the *Membrana adipoſa* conſpicuous.

Beſides the commonly deſcribed Proceſſes or Eminencies of the Auricle, formed by the Windings of its Cartilage, he takes notice of another that's ſmall and acute, ſituate near the beginning of the auditory paſſage.

He has diſcovered ſome little Glands, of the Conglobate or Lymphatick kind, which, with reſpect to their ſituation upon the *Tragus*, he calls *Glandulæ Tragi*: Theſe are ſometimes three in number, ſometimes two, but for the moſt part there's only one of them to be found in each Auricle.

To the four external Muſcles of the Auricle, deſcribed by *Caſſerius*, he adds a new one of his own diſcovery, and names it, *Muſculus Auriculæ Anterior.* It ſprings from the Inveſting Membrane of the Temporal Muſcle, above that part of the *Zygoma*, which proceeds from the *Os temporis*: Thence running ſtreight down, it ſplits into two parts, one being inſerted into the fore part of the ſuperior Cavity of the *Conchæ*; the other a little higher into the fore part of the Cavity of the *Scapha.*

He ſays the poſterior Muſcles of the *Auricula* vary as to their number in different ſubjects; there being ſometimes four, and ſometimes but two of them; yet for the moſt part there are three in each Auricle.

Beſides theſe, he deſcribes two Internal Muſcles belonging to this part; which he ſays none has hitherto taken notice of: One he calls *Muſculus Tragi*, the other *Muſculus anti-tragius*, according to their ſituation; but in Bodies lean and emaciated they are not to be ſeen, as he owns himſelf.

He has diſcovered a new Ligament, which faſtens the Auricle to the *Proceſſus Zygomaticus* of the Temple Bone.

Upon filling the *Meatus auditorius* with Wax, he obſerves that in the beginning it aſcends a little, then about its middle it's crooked downwards; again it runs upwards and then downwards to the *Membrana Tympani*, by which it is obliquely ſhut.

He deſcribes the *Inciſuræ*, or Slits in the cartilaginous part of this paſſage, more accurately than Monſ. *Duverney* has done.

When the *Membrana Adipoſa* comes to the beginning of this *Meatus*, its Fleſhy Fibres are ſpread upon it in a reticular manner, and in the *Area*'s or ſpaces between, the Glands which ſeparate the *Cerumen* are placed.

The Cavity of this Auditory Tube in a *Fœtus* is very much contracted, and filled with a whitiſh ſtuff, which in proceſs of time days, falls off, and comes out with the *Cerumen*; yet ſometimes it hardens into a Membrane, which ſticking cloſe to the *Membrana Tympani*, hinders the free acceſs of the Air, and ſo cauſes a Deafneſs, till it is removed by Art.

Our Author obſerves in the back-part of the Auricle a Vein, which he ſays none has hitherto taken notice of, and calls it *Occipitalis*, becauſe it receives ſeveral Twigs from other parts about the *Occiput*, from all which it brings back the refluent Blood into the lateral *Sinus*'s, piercing the *Cranium* at a hole behind the *Proceſſus Mammillaris*.

None of the branchings of the hard portion of the Auditory Nerve are ſpread upon the backſide of the Auricle, as ſome write and delineate, for the Nerves that ſupply that part come out between the firſt and ſecond *Vertebra colli*: A twig of this Nerve running upon the back of the *Antitragus* is ſometimes ſucceſsfully cauterized in the Tooth-ach.

It's very probable, that there are Lymphaticks both in the Auricle and Auditory paſſage.

That the *Membrana Tympani* is made up of two Membranes is very apparent in a *Fœtus*, the innermoſt of which is from the *Dura mater*, and the outermoſt is only an expanſion or continuation of that fine Skin that inveſts the *Meatus Auditorius*.

He thinks the paſſing of the Smoke of Tobacco from the Mouth by the Ears, the evacuating of *Pus*, *&c.* from the Barrel the ſame way, ſeem to evince the neceſſity of a Perforation, or *Hiatus*, in the *Membrana Tympani*; tho none of his repeated Experiments were ſo ſucceſsful as to diſcover it hitherto.

He reckons the *Sinus*'s of the *Proceſſus Mamillares*, which are divided into ſeveral Cavernous Cells, as part of the cavity of the Barrel, becauſe they communicate with it: And in ſome other Animals, where theſe *Sinus*'s are wanting, the *Cavitas Tympani* is conſiderably larger.

The head of the *Malleus* lyes hid in the beginning of the *Sinus Maſtoideus*, but is no ways connected thereto.

In its *Manubrium* or Handle he demonſtrates three Proceſſes, which he names *major*, *minor* and *minimus*: To the three Muſcles of the *Malleus*, he gives the ſame names of its Proceſſes to which they are inſerted.

Muſculus proceſſus majoris, firſt diſcovered by *Euſtachius*, riſes from the Cartilaginous part of the *Tuba Euſtachiana*, and not from that Bony Canal, which runs laterally upon the Oſſeous part of the ſame; then, running along that Canal, it enters the Barrel, where its Tendon being inflected a little downwards, is inſerted in the *Proceſſus malleoli major*. He ſays, that none have taken notice of the true Origin of this Muſcle before him, notwithſtanding its riſing from the Tube does very much conduce to Hearing.

Muſculus proceſſus minoris, is the *laxator auris externus*: he reprehends ſome modern Anatomiſts for omitting the deſcription of this Muſcle, tho fairly deſcribed by *J. Caſſerius* long ago.

Muſculus proceſſus minimi begins at the ſide of the Barrel that's next the Face, and running along the ſame, it comes to its Inſertion, being inflected under the *Chorda Tympani*, in the ſmalleſt proceſs of this Bone.

The *Incus* is joyned by ſmall Ligaments to the *Malleus*, whence theſe Bones have either no motion at all, or but a very obſcure one between themſelves. The long Leg of the *Incus* runs parallel with the handle of the *Malleus*, whoſe extremity is crooked a little downwards: Its ſhorteſt Leg is connected to the ſide of the *Sinus Mammillaris* by a Ligament, which yet allows it a ſmall motion.

The Bone that *Sylvius* diſcovered ſhould be called *Ovale*, from its Figure, and not *Orbiculare*, ſince it's not round.

The Figure of the Baſis of the *Stapes* comes nigh an *Elliptick*, yet its margin is a little defective on one ſide. Its convex is towards the *Labyrinthi Veſtibulum*, and Concave towards its Head. Its Bony ſubſtance is ſo thin, that it is almoſt tranſparent, and not pierced with holes, as a certain Modern deſcribes it.

The Sides or Branches of the *Stapes* are furrowed on the inſide; the ſpace between being ſometimes ſhut with a Membrane, and often but half ſhut; but for the moſt part he obſerves no Membrane at all between them. The *Stapes* ſtands on the *Foramen Ovale* in a middle poſition, between Vertical and Horizontal; it ſhuts this hole exactly, being faſtened to its Margin by a thin Membrane, but yet ſo looſely, that it has the freedom of moving up and down; which motion he thinks contributes much to Hearing; for upon opening the Ear of one that had been very long deaf, he obſerved, that the Oſſification of this very Membrane was the only cauſe of his deafneſs. The fleſhy Belly of the *Muſculus Stapes*, firſt diſcovered in a Horſe by *Caſſerius Placentinus*, is contained in a Bony Channel, excavated about the middle of the true *Fallopian* aqueduct laterally, from which its Tendon is obliquely carried to the head of the Stirrop.

Tho' thoſe four little Bones have no *Perioſtium*, yet ſeveral Blood Veſſels run upon them, and enter their Subſtance, which is very compact and hard; the *Stapes* indeed is ſomething brittle, not becauſe its more porous than the reſt, but becauſe it conſiſts only but of one Bony *Lamella*.

The *Feneſtra rotunda* he ſometimes obſerves to be of an Oval Fignre: The Membrane that ſhuts it is faſten'd lower down than its Margin.

He deſcribes ſeveral ſmall holes that pierce the *Cranium*, and open into the *Tympanum* juſt above the articulation of the *Malleus* and *Incus*, by theſe extravaſated Blood or Purulent Matter, contain'd within the Skull, may be carried into the Cavity of the Barrel; from whence they may either paſs thro' the *Hiatus* in the *Membrana Tympani*, or elſe by the *Tuba Euſtachii*, and ſo be evacuated by the Mouth. He proves the exiſtence of ſuch holes by injection, and two practical obſervations.

The Duct that goes from the Ear to the Palate, he calls from its Figure and firſt obſerver, *Bartholomæus Euſtachius*, *Tuba Euſtachiana*: Its conſiſts of a Bony, Cartilaginous, Membranous and Fleſhy part. The Membrane that lines it is full of Glands.

For, to dilate and keep this Tube open, he has found out a new Muſcle, which *novus Tubæ Muſculus*, as he calls it, riſes Fleſhy from that portion of the Tube that's between the beginning of its Cartilaginious part and its extremity; hence deſcending obliquely by the lower part of the Internal *Ala* of the *Proceſſus Pterigoides*, it becomes Tendonous, which growing broader again, is ſo inſerted into the Inferior Margin of the Membrane, that covers the *Foramina narium*; where it joyns with its fellow on the other ſide.

The *Uvula*, which he conſiders as part of the *Pharynx*, is moved by three pair of Muſcles, one known long ago, but ill deſcrib'd, and two new ones diſcovered by himſelf.

1. *Salpingo-ſtaphilinus*, it riſes from the Inferior Bony part of the *Euſtachian* Tube, whence it deſcends obliquely to its Inſertion into the Baſis of the *Uvula*, where it joyns its Fibres with its Partner-Muſcle on the other ſide.

2. *Gloſſo-ſtaphilinus*, this comes from the lower part of the Tongue, and ends near the middle of the *Uvula*.

3. *Pharngo-ſtaphilinus*, it has a large and broad beginning from the lower part of the *Pharynx*, whence aſcending and paſſing under the *Tonſillæ*, it terminates at the ſide of the *Uvula* laterally.

When we Inſpect the Mouth of a living perſon, the two Arches or Riſings we obſerve at the ſides of the *Uvula* proceed from the ſwelling of the two laſt deſcribed Muſcles.

In the *Pharinx* he obſerves three Orifices, one that leads to the Mouth, another to the Noſe, and a third to the *Oeſophagus*; all which are dilated and contracted by the following Muſcles, whoſe deſcriptions do extreamly agree with the Life, as I alſo obſerved in the ſame Subject.

1. *Pharingo-ſtaphilinus*, or *Staphilo-pharingæus*, it's the ſame with the third Muſcle of the *Uvula*, and ſerves the motions of both in common, being by ſome falſely called *Cephalo-Pharyngæus*.

2. *Gloſſo-Pharyngæus*. Falſly called by ſome *Sphæno-Pharyngæus*. Its origin is in common with the *Gloſſo-ſtaphilinus*, whence it goes round the upper part of the *Pharinx*, uniting with its fellow of the other ſide by a Tendinous line.

3. *Stylo-pharingæus*. He adds nothing to the known deſcription of this Muſcle.

4. *Hyopharyngæus*. This has a double Origin, one from the Horns of the *Os Hyoides*, the other from the Cartilaginous Appendages near the Baſis of that Bone; from whence it ſurrounds part of the *Pharynx*, and joyns with its Partner by a middle line.

He adds, that a Violent contraction of this pair of Muſcles may cauſe a luxation of the foreſaid Appendages, which hinders deglutition till reduced.

5. *Thyropharyngæus*. Riſes from the ſides of the *Cartilago Thyroidea*, and like the former, goes round the *Pharynx*, uniting with its fellow in its middle and back part.

6. *Cricopharyngæus*. Riſes from the Cartilage of that name, and like a Sphincter ſurrounds the beginning of the *Oeſophagus*.

Tho I deſign'd not at this time to have made any remarks upon what our Author advances in this Treatiſe, referring that to another opportunity, yet I cannot refrain from one reflexion *en paſſant*; which is this: Had the accurate *Valſalva* read and examin'd what Mr *Cowper* has wrote ſome time ſince, of the Muſcular Structure of the *Fauces* in his excellent Book of *reformed Myotomy*, an Abſtract of which our Author might have ſeen in the *Acta Eruditorum*, publiſhed *anno* 1696. *Suppl. Tom.* ii. *pag.* 508. He had certainly obliged us with a better and more compleat account of its Muſcles, for he has wholly omitted the moſt conſiderable part of Mr *Cowper's Muſculus Pterigopharyngæus*,

which

which riſes from the *Proceſſus Pterigoides*, being ſatisfied with deſcribing only the lower part of it, which ſprings from the Tongue and the *Os Hyoides*, which he makes to be two pair of diſtinct Muſcles. I wonder how he came to overlook this, which I always obſerved to appear in Diſſection, as Mr *Cowper* has deſcribed it, ſince his happy Induſtry has lead him to the diſcovery of ſeveral parts in the Ear, *&c.* which are not to be found in any Book extant.

He ſays the *Muſculus Chondrogloſſus*, deſcribed by a certain Modern, is not always to be found.

The Artery that furniſhes this Cavity with Blood goes off from the Carotide, while in its oblique Canal in the *Os Petroſum*: And the Vein that carries back the refluent Blood opens into the *Diverticulum* of the *Jugular* Vein. He thinks it may have Lymphaticks as well as the external Cavity of the Ear.

He reckons the *Chorda Tympani* to be a twig of the *Portio dura*.

He ſays, that there are twelve Orifices that open into the *Veſtibulum, viz.* the *Feneſtra Ovalis*, the five Orifices of the Semicircular Canals, one of the Canals of the *Cochlea*, and five holes that admit ſo many twigs of the *Portio mollis Nervi Auditorii*.

He diſtinguiſhes the Semicircular Canals into the *major*, *minor* or *minimus*.

He is very nice in adjuſting the different lengths of theſe Canals, and the proportions they bear to one another in their Diameters, which are different in different ſubjects, but always alike in both Ears of the ſame ſubject.

The *Cochlea* conſiſts of a *Modiolus* or *Cone* and a *Septum*, which divides it into two Canals, which he calls *Scalæ*; that which reſpects the *Feneſtra rotunda* is the *Scala Tympani* or *Superior*; the other which communicates with the *Veſtibulum* he calls the *Veſtibuli Scala*: He is alſo very curious in aſcertaining the difference between the two *Scalæ*: He remarks that Modern Anatomiſts do err in the poſition of theſe *Scalæ* or turnings; for what they call the ſuperior he rightly names the inferior, *& è contrà.* Its *Septum* is made up of two ſubſtances, one hard but very friable, call'd *Lamina Spiralis*, the other ſoft, thin and pellucid, which he calls by a new name *Zona Cochleæ.*

The Canal, by which the Auditory Nerves enter, he divides into the common, which admits both the ſoft and hard pair together, and the particular, which contains only the *Portio Dura*: He obſerves that it's this particular Canal in which the hard portion lyes, that *Follopius* firſt diſcover'd and nam'd it, *ob ſimilitudinem, Aquæductus*: The *Tuba Euſtachii* is very falſly, tho' now commonly ſo call'd.

He obſerves, that as the *Portio dura* turns aſide from the common Channel into its own, it detaches one Branch, which going out,at a hole in the inſide of the *Os Petroſum*, ſpreads itſelf upon the *Dura Mater* and Trunk of the 5th pair of Nerves in ſeveral ſmall Twigs.

In the bottom of the common Canal, he takes notice of three ſmall Sinuoſities or Cavities, one deſcends towards the Centre of the *Cochlea*, in which are ſeveral holes for the entry of part of the *Portio mollis*, where it is dilated into a very fine Membrane which makes the *Zona Cochleæ*; the ſecond goes towards the *Veſtibulum*, through which the *Portio mollis* enters by five holes, where its twigs or branchings are preſently expanded into a very fine Membrane, which lines all its ſurface, being further continu'd thro' all the Semicircular ducts: This Nervous expanſion, from it reſemblance to a very thin and narrow Ribbond or Fillet, he calls *Zona*, and from its uſe, *Sonora*, of which he reckons three, according to the number of Canals: He ſays, theſe *Zonæ Sonoræ*, are very conſpicuous in ſeveral Quadrpudes, and in Volatils eſpecially.

The *Labyrinth* has both Veins and Arteries, tho' its Cavity is not inveſted with any *Perioſtium* for to ſupport them, but whether they proceeed from thoſe diffuſed thro' the *Os Petroſum*, or if they enter together with the *Auditory* Nerves, he cannot poſitively determine.

He doubts not but theſe Veſſels are alſo accompanied with *Lymphaticks*, as well as thoſe of the *Retina*, as he has obſerved in the Eye of an Ox.

For the uſe of the Parts, on which our Author is exceeding large, I refer the Reader to the Book itſelf, which is inriched with a number of curious Cuts, eſpecially of the parts relating to the Ear, drawn from the Life, and well Engraven.

London, Printed for *Sam. Smith* and *Benj. Walford*, Printers to the *Royal Society*, at the *Princes Arms* in St *Paul's* *Church-yard*, 1705.

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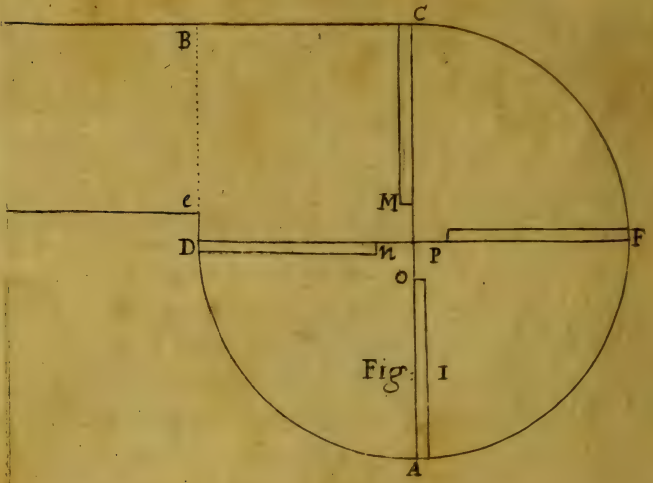
Fig 1

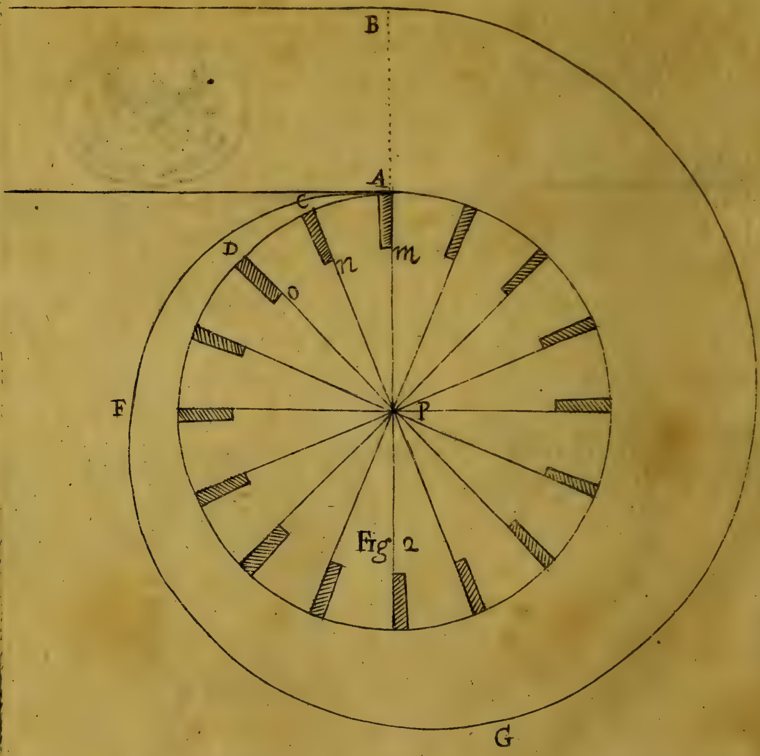
Fig 2

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PHILOSOPHICAL TRANSACTIONS.

For the Month of June, 1705.

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Olaui Rudbeckij Atlanticæ, *ſive* Manhemij *pars ſecunda. In qua Solis, Lunæ & Terræ Cultus deſcribitur, omniſque adeo ſuperſtitionis hujuſce Origo parti* Sueoniæ *Septentrionali, Terræ puta* Cimmeriorum *vindicatur, ex qua deinceps in orbem reliquum divulgata eſt, &c. Accedunt demonſtrationes certiſſimæ, quæ Septentrionales noſtros, in maxime genuinum Solis ac Lunæ motum, indeq; pendentem accuratiſſimam temporum rationem, multo & prius & felicius quam gentem aliam ullam penetraſſe declarant.* Upſalæ. In Folio.

I. *Part of a Letter from Mr* D. Papin *to Dr* Frederick Slare, *Fellow of the College of Phyſicians and of the Royal Society, concerning an Improvement of the* Heſſian *Bellows,* &c.

I Am buſie at preſent for a Coal-mine, which hath been left off becauſe of the impurity of the Air: I have therefore improved the *Heſſian* Bellows: I don't queſtion but you have ſeen that new contrivance, printed *Lipſiæ in Actis Eruditorum anno* 1699. with this Title, *Rotatilis Suctor & Preſſor Haſſiacus:* And it may be apply'd for Wind as well as for Water. At that time the ſhape of the *Tympanum* was Cylindric, as may be ſeen Fig. 1. where D A F C is the circumference: C P, D P, A P, are the *Radii* which bear the Wings C m, D n, A o: C E is the aperture through which the Wind muſt be driven in the direction of the Tangent C B: And it may be obſerv'd that when the Engine is working, every Wing from the end of the aperture E, till it comes to the beginning of the ſame aperture C, drive always the ſame Air, with the ſame ſwiftneſs, and at the ſame diſtance from the Center: So that in peruſing all that circumference, the Air doth find reſiſtance by friction, and gets nothing at all. I do therefore now make the circumference of the *Tympanum* in a Spiral ſhape, which is to be ſeen *Fig.* 2. where the Spiral circumference is A F G B, the *Radii* are A P, C P, D P, *&c.* The Wings are A M, C N, D O, *&c.* The aperture is A B. And it is to be obſerved, that every Wing in going round drives new Air, becauſe the Air which is firſt in motion finds place to recede from the Center towards the Spiral circumference; and ſo it gives room to new Air to come to the Wing: And when the Wings come near to the Aperture, they drive their new Air into the Aperture without any friction; and the Air which hath been firſt driven and removed from the Wing, cannot loſe its ſwiftneſs, becauſe the Wings which continually follow do continually drive new Air, which keeps that which is before always in the ſame ſwiftneſs. This new ſhape of the *Heſſian* Bellows affords alſo another advantage; becauſe the Air in going round follows the Spiral line, which is nearer to the ſtraight line than a Circular circumference; and when the Air comes to the Aperture, it gets into it without any loſs of ſubſtance; but in the Cylindrical Machine, *Fig.* 2. the Air doth always go round in a Circular circumference; and when it comes to the Aperture, the Wind is driven directly in the direction of the Tangent but juſt in the beginning at C; and afterwards the Impulſion is oblique: And this obliquity is always increaſing until the Wing comes to the *punctum* A: Now it is known how much diminution ſuch an obliquity can make to the ſtrength. I believe therefore that this Spiral figure is a good improvement to this Engine. And indeed I have made ſuch Bellows where the *Radius* AP is but 10 ½ inches, the Wing A m 2 inches broad and 9 inches high; becauſe the *Tympanum* is alſo ſo high, or little more; the Aperture AB is alſo 9 inches, or a little more, ſo that it makes a ſquare hole. When I work this Engine with my Foot, it makes ſuch a Wind that it may raiſe up two pounds weight; and without doubt a ſtronger Man could do much more: But this is more than ſufficient for our purpoſe, ſince we muſt but drive Air enough for the reſpiration of ſuch Men that can work in the Mine; and we may eaſily with Boards make Wooden Pipes, to carry the Wind to the very bottom: So that the Air within will be continually renewed as well as without.

His Serene Highneſs being gone to *Shualbach*, I muſt expect his return to apply the Engine to the Mine; and I hope then I ſhall be able to impart the ſucceſs to the Royal Society.

About the Engine, proved before a Committee of Parliament, to demonſtrate the power of Water expanded by Fire, I will tell you that we have here made very good Experiments of that matter before Winter. We have raiſed Water to the heighth of 70 foot, by a very commodious way, which may be yet very much improv'd; and becauſe his Serene Highneſs was deſirous to ſee ſomewhat more, the Engine was left too long in the River, ſo that the Ice broke it, and carried away part of the ſame; and ſince that time other deſigns have been undertaken, ſo that this Water Engine is not yet repaired: I hope in time we ſhall again work about that as well as about a Furnace, to which the *Heſſian* Bellows will be very uſeful. I have already made a little tryal of it, and I had a very ſtrong Fire in a Furnace, to melt Glaſs, Iron, or any other hard Mettal; and yet I could open the Furnace above the matter to be wrought upon, and yet no Flame would get out through the Aperture; nor cold Air from without get into the Furnace: So that it is very like this will be a great conveniency for ſeveral ſorts of Work, ſince Men may work the Matters when they are moſt ſoftned in the Fire; and they may be drawn up Perpendicularly, that they may not be bent, as they are when we draw them Horizontally. I believe that would be good, eſpecially to make eaſily Glaſs Pipes and Looking-glaſſes of an extraordinary bigneſs. It would be too long to give now the deſcription of theſe Inventions; and I have made mention of theſe but by the by, to ſhew that the *Heſſian* Bellows are an Invention that may be apply'd to ſeveral good uſes, and ſo that deſerve very much to be improved.

II. *Part*

II. *Part of a Letter, written to a* Moſt Reverend *Prelate, in anſwer to one written by his Grace, judging of the Age of MSS. the Style of Learned Authors, Painters, Muſicians,* &c. *By Mr* Humfrey Wanley.

London, July 11. 1701.

THe ſubſtance of what your Grace is pleas'd to ſay about *Manuſcripts* and *Copied Writings* (as I apprehend it) is, *That 'tis not only poſſible, but very eaſie, upon the peruſal of a written Book, to pronounce in what Age or Century it was written, ſuppoſing a man to be tolerably well vers'd in Books of that Language or Country. And that this judgment may be made, only by obſerving the Shape and Figure of the Letters of the Book, which (as all other things) have their fix'd Periods for their Duration : as being form'd this way in ſuch a Century, and ſuch a way in the next ; Time only (which alters the outward ſtate of other things) working this Change in Letters alſo, of what Age, Language, or Country ſoever they be.* And then as to Original Compoſitions, your Grace is of Opinion, *That the Style and Diction of any noted Author being well obſerv'd, 'tis very eaſie to diſcover ſuch others of his Works as have gone abroad without his Name ; and alſo the very time when the Author Liv'd.*

'Tis evident, my Lord, that a man may judge of *ſome* MSS by the Hand ; and of the Genuine and Spurious Works of *ſome* Authors ; and of the *time* likewiſe, wherein they liv'd, by the *ſtyle* of them ; but whether this be ſo *eaſie* a Work, and that the Rules men generally go by in theſe caſes, are *always infallible Guides*, is what (I own) I very much doubt of.

Suppoſe, my Lord, for inſtance, a man ſhould bring to any Antiquary a good MS. Copy of the *Hebrew Bible*, *Pentateuch*, or *Pſalter*, written in a ſmall common Letter, without Points, without fine Knots, and Flouriſhes, without Pictures, and great Letters, or any thing that ſhould look like Pompous: Suppoſe that the Ink, Parchment, *&c.* ſhould carry a ſeeming face of Antiquity with them, and that a man ſhould ſay his MS. was 1000, 1200, or 1300 years old, when as really, it was written within a very few years: Could he from the Hand alone ſoon find out the Cheat?

All the *Hebrew* MSS. that I have as yet ſeen, are written either with *Samaritan* or *Chaldee* Letters. As to the *Samaritan*, I own they bear a good reſemblance one to another, and that they differ very much from thoſe *Samaritan* Characters, which we find ſtamped upon divers truly *Antient* and Genuine *Coins*. But then there ſeems to be ſuch a Reſemblance (as to the Character) between thoſe Coins ſtruck in Ages far diſtant from one another, that 'tis hard (from the Conſideration of the *Metal*, its *Fabrick*, *Weight*, from the Shapes of the *Letters* in the Inſcription, *&c.*) to ſay which Coin was made in the time of *David*, or *Solomon*, and which no older than the time of the *Machabees*; this being rather to be gathered from the *Words* and *Meaning* of their Inſcriptions, than from the Figure of the Characters which Compoſe them. The ſame may be ſaid, in a great meaſure, of the old *Greek*, *Punic*, *Roman*, *Brittiſh* and other Coins.

The *Chaldee* Character has indeed varied in tract of time, according to the different Fancies and Humours of men. The *Even plain* Letter, I think, is the moſt Ancient. This they altered into a more *neat* way of making it, as your Grace finds in *R. Stephens Hebrew* Bibles. There is a third faſhion, of *waving* the perpendicular ſtrokes like Rays, as your Grace remembers in ſome of the *Hebrew Coins* exhibited in the *Prolegomena* to the *Polyglott* Bibles.

Then fourthly, there is a *large fat* Letter in the MS *Rituals* and *Liturgies*, beſides the *Rabbinical Letters* of *Italy* and *Germany*, with their *Offſpring*; the *Litteræ Coronatæ*, and perhaps others that I never ſaw: (Not to mention here the *Jewiſh* Cuſtom of writing the *Vulgar Language* of the Country wherein they live, with *Hebrew Letters.*) It ſeems a hard matter, my Lord, to trace the *Original* and *Progreſs* of all theſe ways of Writing, ſo, as upon the bare ſight of a MS. written in the *Hebrew* Language or Character, to ſay, *by the ſhape of the Letters of this Book it appears to be ſo old:* and it ſeems much more difficult to aſſign the particular *Province* or *Countrey* wherein each *Hebrew* Book was written, as for example, in *Italy*, *France*, *Spain*, *Portugal*, *England*, *Holland*, *Germany*, *Poland*, *Barbary*, *Perſia*, *India*, in the ſeveral Provinces of *Turkey*, *&c.*

The ſame almoſt may be ſaid of the *Greek Manuſcripts*, in which Language there has been a great diverſity of Writing, according to the *different humours of the Scribes*; the *Faſhion then in uſe*, or the *Manner of that particular Province*, in which ſuch a Book was written. Nor is it eaſie (tho one would be apt to take ſuch *Differences* for ſo many Land-marks,) to tell the Age of a *Greek MS.* without the Date; and I never yet ſaw ſuch a *Date* ſo high as the year 6400, according to the *Greek* Computation. And it is ſtill much harder, from any Remarks about the *Character*, *Illumination*, *Ink*, *Parchment*, *Paper*, *Binding*, *&c.* to find out what * *Country*, *Province*, or *Iſland*, ſuch a *Greek* Book ſhould be written in, or what *Country-man* the [†] Scribe ſhou'd be. Nay, and what does farther add to the Difficulty, is, that 'tis known that the ſhapes of the *Majuſcule* Letters found in *Greek* MSS, have been retain'd for above 600 years together, with little Variation; and alſo, that ſome MSS. written with *Minuſcules* and with Accents, are older than ſome others which want them. And alſo, that the preſent *Greek Copiſtes* or *Librarij* have three or four different Hands commonly uſed by them, one being their own *Common Hand*, the others an Imitation of old MSS, which are more beautiful, but troubleſome in writing, than their ordinary Running Hands: It being cuſtomary, as I have been told, when a man wants a Copy of ſuch a Book to be written, for the *Copiſte* to ask in what Hand it muſt be written (for one Hand, it may be, is more Coſtly than another;) and according as they agree, the Book is written. And thus I have ſeen ſome very new Things written in the ſame Hand with Books which are certainly 400 years old.

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* If a man is born in one Country and writes a Book in another, keeping ſtill to the *Character and manner of Writing* uſed in his own Country, I look upon it as the ſame thing as if he wrote it at home. And therefore I look upon the *Greek* MSS. which *Angelus Borgecius* wrote at *Paris*, as if they were written in *Candy*, where he was Born. And ſo (amongſt many others) to inſtance in a *Latin* MS, I look upon a Copy of Pope *Gregory's* Paſtoral Care, (now remaining in the *Bodleian* Library) as a noble Monument of our *Saxon* Anceſtors: Tho *St Willibald* wrote it, perhaps, at *Mount Caſſinum* in *Italy*, and afterwards (as it is probable) carried it with him into *Germany*, where it remain'd at *Wurtzburg* till that City was plunder'd by the *Swedes* about 70 years ago.

What Methods Learned Men have taken, in order to inform themſelves of the *different Ages of MSS*, I know not, but my own has been this. I have been careful to get all the *Dates* I could, wherein 'twas ſaid that ſuch an individual MS was written, at *ſuch a time*, or by *ſuch a particular perſon*; every Book with a *Date*, being as a *Standard* whereby to know the Age of thoſe Books of the *ſame* or a *like* Hand, and of thoſe that are not very much *older* or *newer*. Where Dates have been wanting in ſome Books, perhaps they have had ſome Succeſſion of *Emperors*, *Kings*, *Popes*, *Biſhops*, or other *Officers*; and ſetting down the continuance of their Predeceſſors for ſo many *years*, *months*, and *days*, if there be only the naked Name of him who is the *laſt* in order, (all other Circumſtances concurring,) I then judge the Book to have been written during *the Life or Reign* of ſuch a perſon. Eſpecially if that Succeſſion be afterwards continu'd by a more recent Hand, or that there be two ſuch Succeſſions, as of *Kings* and *Biſhops*, and the *laſt* of each happen to be Cotemporaries. Other Obſervations I have made from *Hiſtorical Notes* and *Eccleſiaſtical Tables*, in ſome Books. At other times I light upon ſome *Authentic Charter* or *Original Writing*, in the ſame Hand with ſuch a Book as I have remembred to have formerly ſeen, but without any gueſs at the Age of it. The Age of the *Charter* being known, that of the *Book* is then known alſo: for I never entertain'd any Notion, or relied upon any Obſervation, but as I found it confirm'd by the Suffrage of concurring Circumſtances, and ſufficient Authority.

[†] Now this may in ſome meaſure be done by *Latin* MSS. becauſe there are greater plenty of them. For even I, by exactly obſerving the nature of the Characters, *&c.* of thoſe MSS. whoſe *Country* I was ſure of, have afterwards been enabled to ſay, that *this Book looks as if it had been written in* France, Italy, Spain, Germany, *the* Netherlands, England, Ireland, &c. *and,* it may be, *about ſuch a time.*

But even in *Dates*, I have found that a man ought to be very Cautious; for ſome have been *altered* by later Hands, for corrupt and baſe Ends. Some are ſo worded, as when one thinks that the time they mention, is the time when the MS. was finiſh'd by the *Copiſte*, or *Book-writer*; it is meant only as to the time when the *Author* finiſh'd his Compoſition: Other Books are *Poſt-dated* that they might be accounted New. Of this laſt kind, is a *Greek* MS. I ſaw in the Univerſity Library at *Cambridge*, which, as appears by a written Annotation therein, was *bought* ſuch a year at *Rome*, for ſo much; and yet the Date pretends that the Book was *written* at *Rome* in ſuch a year, which happens to be two years after it was bought and paid for. The Reaſon of theſe *Poſt-Dates* was, becauſe, before Printing came up, a Book was by how much the *Newer*, by ſo much the more *Valuable*. An *old Book* might be bought for an *old Song*, (as we ſay) but he that tranſcribed a freſh Copy muſt be paid for his pains. And therefore, I have found in ſome Catalogues of the MSS. formerly extant in our *Abbey-Libraries*, that when they ſaid ſuch a Book was *Liber Vetus*, they would often add, *& inutilis*; but *Liber Novus* was *Nitidus*, *eleganter ſcrip-*

tus, *lectu facilis*, *&c.* which mean Opinion of the Ancient Copies, by the way, may have been the Occaſion of the Loſs of many a good Author.

The *Librarii* or *Book-writers* were from the time of the *Romans* a particular company of men, and their Buſineſs a Trade: But tho *Book-writing* was their profeſſion, yet they afterwards had but a third part of the buſineſs.

Learning (after the Erection of Monaſteries,) was chiefly in the hands of the *Clergy*; and they were for the moſt part *Regulars*, and liv'd in Monaſteries: Amongſt theſe were always many induſtrious men, who wrote continually new Copies of old Books, for their own uſe, or for the Monaſtery, or for both; which ſeems to have ſwallowed up above half the buſineſs. Then, if an extraordinary Book was to be written, for the *ſtanding*, *and more particular Uſe* of the Church or Monaſtery, the *Antiquarius* muſt be ſent for, to write it in *large Characters*, *after the old manner*, and ſuch a Copy they knew would laſt for many Ages, without Renovation. Between theſe two ſorts of People, the *Writing-Monks* and *Antiquarii*; the poor *Librarij* or common *Scriptores* (who had Families to maintain) could hardly earn their Bread. This put them upon a quicker way of diſpatch, that ſo they might underſell one another: And in order to this Diſpatch, they would employ ſeveral perſons, at one time, in writing the ſame Book, (each perſon, except him who wrote the firſt Skin, beginning where his Fellow was to leave off:) Or elſe, they would form the Letters *ſmaller and leaner*, and make uſe of more *Jugations* and *Abbreviations* than uſually others did. And this, my Lord, is the only account that I can give, for that *Variety* of Hands which in former Ages, being learn'd of, or borrow'd from the *Romans*, was commonly us'd, and in faſhion at the ſame time, and in the ſame Country, (throughout theſe Weſtern Parts of *Europe*,) and for their growing leſs and leſs for one Age after another. An Inſtance of this may be given from the

Hands of England, which about the year of our Lord 730 was of three ſorts.

I. The *Roman Capitals*, ſtill retain'd, and kept up by the *Antiquarij*, in ſome Books and Charters.

II. The more *Sett Saxon Letters* (which have a near affinity with the *more Antient Iriſh Characters*, as being with them derived from the *Roman*;) which were uſed as the Common Hand of the Age, by the Monks in their *Books*, and ſome *Charters* of their Dictating and Writing.

III. The *Running Saxon Letters*, fuller of Abbreviations, and ſomething of kin to the *Longbardic* and *Franco-Gallic*, (both which, with this third ſort, were alſo of *Roman* Original,) and was uſed by theſe *Librarij* in their Books and in the Charters; as alſo by ſome Authors who wrote much, as *Bede*, *&c.*

There was another ſort of *Bookwriters* ſtill in uſe, namely, the *Notarij*, whoſe buſineſs it was to take *Tryals and Pleadings* at Courts of Judicature; to *write* as *Amanuenſes* from the mouth of an Author; and to take *Homilies* and *Sermons* at Church, from the Mouth of the Preacher. Theſe *Notarij* made uſe of *Notæ* or *Marks* inſtead of Letters: But when, in Proceſs of Time, Letters were uſually written ſmall and quick, and Abbreviations grew Common, the *Notarij* were turn'd off, unleſs they would write Books in *Long Hand*, as other *Librarij* did, and their *Notæ* grew out of uſe; and moſt of their Performances in *Notes* or *Marks* have been ſince deſtroy'd.

Suppoſe then, my Lord, that a man had one *Latin* Book of each of the four ſorts above-mentioned laid before him, written all at a time, and without any *Date* or Note of the Age: Would not he be ready to ſay that the three firſt were older than one another? As that that in *Capitals* was older than that in the *Midling* Hand; and this again older than that in the *Running* and *ſmaller* Hand? and that ſuch a Book written in the *Notæ* being all full of marks, was not *Latin*, but of ſome other unknown

known Language? But to come down later; Suppoſe that a perſon ſhould have ſome recenter *Books* or *Charters* laid before him in the *Pipe*, *Text*, *Exchequer*, *Chancery*, *Court*, and *Common Hands*, all written at the ſame time, would not he be apt to ſay, that one ſeem'd to him to be older than another, and that they were the Hands of ſeveral Nations?

If it be difficult for an Inquiſitive Perſon to be a perfect Maſter in all the Succeſſions of Hands, that have been us'd in his own Country, ſo far as he may be guided by the Monuments therein extant, (and I never heard of any Man that was ſuch a Maſter) ſurely, it muſt be more difficult to pronounce the Age of thoſe Books, *from the Hand*, which were written in other Countries, in an unknown Language. And what may make a Man yet more liable to miſtakes (beſides the want of Dates in the moſt Antient *Greek*, *Latin* and other MSS) was the Practice of many Writers, ſtill to Uſe the very ſame Hand when in Years, as they learnt when they were Young; like as many Antient People, who do yet continue to write the *Roman* and *Secretary Hands*, which were more faſhionable 50 or 60 years ago, than now. I forbear to trouble your Grace with any more Words upon this head, or to make mention of the different ways of Writing in any other Language: becauſe I find this Letter will prove larger than I intended. I will therefore (with your Grace's leave) touch upon the next Head in your Graces Learn'd Eſſay, ſhewing the great *Eaſineſs* of finding out an Author,and the Time he liv'd in, by his *Style* and *Phraſe*.

I wiſh, my Lord, that it was as eaſie to diſcover the *Villanous Authors* of ſome Treaſonable and Scandalous Libels, by their *Style*, as it has been to find out the *Printers*, by the *Paper* and *Letter*. Could this be done, it might not be unuſeful to the Government. But People have learnt the knack of changing their Style, upon Occaſion, ſo Artificially, as not to be diſcovered, but when they themſelves are willing to be known. Who would have thought that *Eraſmus* wrote the *Epiſtolæ obſcurorum Virorum?* Or that ſome of the Nicer, nay, the moſt Eminent Modern Criticks could have been impos'd upon by their familiar and near Acquaintance, who trump'd upon them their own recent Performances for invaluable fragments of the Antients, whoſe other works theſe very Critics had lying before them? It has been a frequent Practice in all Ages for poor Scribblers to father their wretched Offſpring upon Illuſtrious Perſons: and the diſparity between the Genuine works of the one, and the Spurious pieces of the other being evident enough, it has been eaſie to diſtinguiſh between the Gold and the Braſs. But, my Lord, I would humbly ask this Queſtion, Is all that is even now by learned men aſcribed to ſome Antient Voluminous *Greek* and *Latin* Authors, undoubtedly theirs? May not there ſtill ſome ſuppoſititious pieces lurk among them, which have the luck to be receiv'd, only becauſe they have been more ingeniouſly counterfeited? Nay, may not the ſame perſon in the courſe of his Life, even alter and vary his Style and Phraſe unwittingly, and without any deſign to do ſo? I think *Mr Richardſon* ſomewhere in his Anſwer to *Amyntor*, upon occaſion of the difference in point of Style between the *Revelation* of St *John* and his *other Works*, between the *Prophecy of Jeremiah* and his *Lamentations*, does tell us from *Dr Cave*, that the conſideration of the *Times when* a man writes, or of the *Perſons to whom*, or the *Subjects about which*, or *the Temper of Body, or the Humour* he is in when he writes, or the *Care and Pains* that he takes in Writing, may Occaſion ſuch Alterations in his Style, as that no certain Rule can be inferr'd from thence.

And if, my Lord, it was really poſſible to find out the Time when an Author liv'd, only by diligent *Reading* his Works, ſurely the World wou'd have been long ſince Agreed as to the Time when *Homer* lived, though they

could

could not tell where he was born. And I believe even in the Liſt of *Eccleſiaſtical Writers* there are ſome, and thoſe not of the leaſt conſideration, who (notwithſtanding their Works have been read over and over) are ſtill reckon'd to be of *incertain Age*.

As for *Pictures*, though I have much leſs Experience in them, than I had once in MSS. yet I will not deny but that the Works of an hundred Maſters (beſides thoſe your Grace has been pleas'd to mention) may be known by the *Hands*, tho they may be almoſt as *different* as their ſeveral Hands in Writing: But that one Painter can't Copy from another, ſo exactly, as that in tract of time it ſhall not be known which Picture is the Original, is what I dare not aſſert.

It has been frequently practis'd by Painters to borrow Pictures of thoſe who are Lovers and Judges of ſuch things, to Copy them, and to return their Copies for the Originals, without any diſcovery made by the diſcerning Owners. And I believe it poſſible (tho exceeding difficult) for a great Maſter to Copy a Picture ſo, that when they both ſtand together, a good Judge ſhall not dare poſitively to ſay which is the Copy and which not: Nor he that drew the Original, dare to own, that he could imitate his own Handywork better than a Stranger has done. There are a great many ſtories common among Painters, to this purpoſe. And one wou'd not think it much more difficult, for a Man to imitate a Drawing or Picture, than to counterfeit another Mans Hand-writing, which ſome People can do moſt exactly. And others with Pen and Ink will Copy after any thing that is Printed ſo nicely, as that one would affirm their *Writing* to be *printed off* at the Preſs.

Your Grace's Notions of diſcerning the *Age* as well as the *Hand* of the Painter, by his Picture, is very curious, and altogether new to me: And I doubt not but there is a great deal in it. I only want the whole Works of ſome great Painter, with an Account of the time when he wrought each Piece, to fit me for the making the Experiment. And why might not this Notion be advanc'd a little farther, and the Painter's *Complexion* be known by his Pictures, as well as his Age? As ſuppoſing that the *Sanguine* do naturally run upon *Pourtraits*, *Poetical Hiſtories*, *Nudities*, *&c.* The *Cholerick* upon *Battel-pieces*, *Sea-fights*, *Fire-pieces by Land or Sea*, *Tempeſts*, *&c.* The *Plegmatick* upon the *Still-life*, *Flower-pieces*, *Birds*, *Beaſts*, *Fiſhes*, *&c.* and the *Melancholic* upon *Landskips*, *Architecture*, *Pieces of Perſpective*, *&c.* Not but that the different Genius of a Country, or the Deſires of a good Cuſtomer, may oblige a Painter to work upon a ſubject, which he had no great Fancy for.

As to the difference in the works of Painters grown old, in reſpect of what they did when young, I doubt no certain Rules can be Eſtabliſh'd as to their Performances in that kind. I know, my Lord, that Painters do generally live faſter than other men, which may at length occaſion a failure in their Sight and Memory, a trepidation in their Hands, *&c.* And yet I never heard that *Michael Angelo*, *Alb. Durer*, *Titian*, and others, painted worſe at the latter end of their long lives, than they did before. Nay, I hear that *Signior Verrio*, tho grown old, Paints now far better than ever, and is grown almoſt aſham'd of ſome of his own Works which he Painted at *Windſor-Caſtle* in the time of K. *Charles* II. There may be this in it, that Aged Perſons having attain'd, thro long Practice, to a greater Experience, to a more Solid and Mature Judgment than they had when younger, are more Cautious of that which they let go out of their Hands; and correct thoſe flaſhy touches of their Pencil, and other ſuperfluous Irregularities, which they and others were formerly very fond of.

As for the *Flame and Motion of the Eyes* in a Picture, or the *Breath in its Mouth*, I can ſay but little, having as yet never had the happineſs to ſee ſuch Rarities, tho I have been admitted to the ſight of ſome of the beſt Pieces of the moſt Celebrated Maſters.

As to the Painters Painting a Living or Moving thing, ſo that one ſhall almoſt *diſcern* the Motion, and *ſee* the *Bird Flying, the Horſe or Hound Running, &c.* that is more eaſie, eſpecially when aſſiſted with the friendly and pregnant fancy of the Charm'd Spectator. In the *Still life* indeed, the Eye is quickly deceiv'd, and tho there are, I believe, ſeveral Maſters now living more Excellent at it than ever *Zeuxis* and *Parrhaſius* were; yet ſtill, with all their Art, 'tis very difficult to impoſe upon a man ſo, as to make him believe 'tis not a *Picture*, but the very *Life* that he ſees before him.

Muſicians ſeem to be under the ſame Predicament with *Painters*, ſince they are obſerv'd to live *Faſt*, as alſo the *Poets*. 'Tis by the Practice of many years that they attain to a juſt Knowledge and Maſtery in their reſpective Arts; and as their firſt Compoſitions are little and light, ſuitable to the Mercurial temper of heedleſs and inconſtant Youth; So, in time, this wears off, and as their Experience and Judgment encreaſes, their Compoſitions grow more ſolid and ſound. A Young Man may make a better *Minuet* or *Jigg*, but the Elder a more ſound *Service* or *Anthem*. The Muſic of the former (with other Accompliſhments) may go a great way towards the enticing a fooliſh Girl to Love; but that of the latter Excites the Devotion, moves the Affections, and raiſes the Paſſions of thoſe truly Religious Souls, who take pleaſure in ſinging praiſes to the Honour and Glory of his name, who lives for ever and ever.

If your Grace ſhall ſay, *that the very beſt Painters, Muſicians and Poets dyed young, or at leaſt before they attain'd to an advanc'd Age, when they would have fail'd or grown dull, as others did:* I muſt beg leave to ſay that Old Men are of two ſorts, either thoſe who *are much affected* with their Age and weakned, or thoſe who *are not*.

If a Man be born of unſound Parents, or hath liv'd all along in an Air diſagreeable to his Conſtitution, or has his Conſtitution always unhealthful, or has liv'd an intemperate or debauch'd Life, or has been cruſh'd by any heavy Misfortunes, or always liv'd in Poverty or Diſcontent; 'tis no wonder, if in ſpight of all this, he attains to old Age: but then he will probably loſe the Clearneſs of his Head, the fix'd Attention of his Mind, the Brightneſs of his Parts, which he might be formerly noted for. If a Man has never had any of theſe diſadvantages to wreſtle with, but has all along been bleſs'd with the Contrary: then, he being bred up to a profeſſion, and always following it, his judgment therein ſtill encreaſes, and his Hand (one would think) ſhould be more nimble and ready, and the Man a better *Painter*, *Muſician* or *Orator* than ever: And why not a better *Poet* too? I ſay, with ſubmiſſion, my Lord, if Mr *Dryden* (tho he was ſaid to be unhealthy at laſt) wou'd have taken as much pains, or had been Allowed time to his Mind for reviſing his later Poems, as in ſome of his former, they might have been as well, if not better accepted. I don't ſee that 'tis *old Age* that does a Man this diskindneſs, but rather, that 'tis the *Accidents* that do too often attend it, which yet many are freed from to the very laſt.

Suppoſe then, my Lord, if *Raphael* or *Vandike*, or the late Mr *H. Purcell*, or *Aleſſandro Stradella*, ſhould have continued their Practice of Painting and Muſic till they grew old, from the Accidents attending which, ſuppoſe them (as a great many other People) to be very free; might we not then have juſtly expected from them, even greater Wonders than they had ever before perform'd? I won't ſay that an *old* General is fitter to be truſted than a *young* one; or that the late *Mareſchal Schomberg* at his death, was a better Souldier (notwithſtanding his Age) than the Preſent Kings of *Sweden* and *Poland*: But rather, that the Study of *Divinity*, or of the *Laws*, do ſeem as nice and large as thoſe of *Painting* and *Muſic.* Now the *old and ſage* Men of thoſe Profeſſions are every where moſt regarded, *they* are found to have the ripeſt Judgments, and they are deſervedly employed in the moſt weighty Affairs appertaining to their Profeſſions. And it has been ſeen (as was partly ſaid before) that ſome *Painters* and *Muſicians* have not at all fail'd as they grew old, but kept that great Reputation to the laſt, which they had before acquir'd.

My Lord, upon the whole, it ſeems to me (tho I know my Opinion is of no weight) that there is a gradual and ſenſible alteration in the appearance of things, and eſpecicially in the Scripture or Hand-writing of MSS. Now theſe ought to be conſider'd with reſpect to the particular *places* wherein they were written.

Every Country is ſuppos'd to have remaining in it, the greateſt Variety and moſt conſiderable Monuments of its own Characters; unleſs they are known to be carried away to other places. And therefore, if any man be deſirous of conſidering the Letters of any Language that has been confin'd to any one particular Region or Province; 'tis but going thither, and it's ten to one, but (if he be diligent) he may ſatisfie his Curioſity very well. For Example, Suppoſe I ſhould be willing to conſider the Nature of the *Iriſh Letters,* their Original, Progreſs and Variations, with their Relation to the *Roman, Franco & Anglo-Saxon :* this might be done by travelling *Ireland* principally, by taking a trip into the *Scotch Highlands*, and perhaps into the *Iſle of Man,* and by conſulting ſome *Engliſh* and *other* Libraries, whither ſome *Iriſh MSS* have been carried.

If I would conſider the *French, Italian, Spaniſh,* or *Engliſh Hands,* each Country affords ſufficient Helps. But if a Man would conſider the Letters of a Dead or Living Language, which *ſpread far, and has been, or is us'd in ſeveral Countries :* he can't be ſuppos'd a perfect Maſter in all the ways of writing that Language, till he has conſider'd the whole State and Succeſſion of its Letters in each of thoſe Countries: Amongſt thoſe Languages I reckon the *Hebrew*, *Arabic*, *Turkiſh*, *Armenian*, *Perſian*, *Greek*, *Latin*, *Teutonic*, *Sclavonian*, *&c*. And tho *Latin* is common amongſt us, and every body is pronouncing the Age of a *Latin* MS, yet I think they would do well to enquire *where* as well as *when* a Book was written. And if they are certain that ſuch a *Latin* Book was written in ſuch a particular Country, or Province, 'tis then more eaſie, by conſidering the Succeſſion of Letters us'd in that Province, or by comparing it with other Books written therein, to ſay *how old* it is. For want of this conſideration many Learned Perſons have been almoſt always out in their Calculations, and have pronounc'd at Random. If then, my Lord, this Method appears Rational, and even Neceſſary, in order to attain a ſufficient Meaſure of this ſort of Knowledge; it follows, that 'tis no eaſie matter to aſſign the Age even of a *Latin* MS, no, not even in *England*, where yet I ſuppoſe there may be as great a Variety of *Latin* Hands, as in moſt other Countries.

As for *Painting and Muſic*, they are Arts that I have always had a great Love and Affection for. I know very well that each Painters *Hand* and each Muſicians *Manner* differs from another, but whether there is a gradual and remarkable Variation from themſelves in the Courſe of their Lives, is what I never heard aſſerted. This is certain, that they can *change* their way of Painting and Compoſing at pleaſure; and therefore, *Mr H. Purcel's Dulcibella* is ſaid not to be like his other Muſic; and *Mr Fuller* the Painter could put one of his Pieces upon Sir *Peter Lely* for a moſt incomparable Picture of *Mich. Angelo*. But then theſe Changes and Variations from their uſual Manners are *very* ſeldom made. And a man generally purſues and practices that which is moſt agreeable to his own Genius. For this Reaſon, when a Painters *Hand* is fixed, his *Manner* is then limited, and ſo when a Curious Perſon comes into a Gallery, he knows that *this* Picture was done by *Ryley*, *Kneller*, *Vandyke*, *Dobſon*, *Tintoret*, *&c.* and *that* to be a Copy after *Reubens*, *Georgeon*, *Salv.* *Roſa*, *Han. Caraccio*, *Pietro di Cortona*, *&c.* When he comes to an *Opera*, to a *Conſort*, or to *Church*, not knowing before-hand what Muſic is to be perform'd, yet he may ſoon diſcern that it was compos'd by *Corelli*, *Baptiſt*, *Baſſani*, *Chariſſimi*, *Blow*, *Purcell*, *&c.* And ſo upon Reading an Antient Author, a ſagacious and learned Perſon may find, that he writes according to the manner of ſuch an Age, that the Style imitates ſuch another, or that the Book, tho it bears ſuch a Man's Name, yet might, perhaps, be more truly aſcribed to another, with whoſe Style it more exactly agrees : As for Example, that Piece of *S. Cyril*'s, publiſh'd from the *Eſcurial* MS. by *Barthaſar Corderius*, is thought (by reaſon of the Analogy in point of Style) to be *Origen*'s : But then, whether *all this* can *be always done*, *done eaſily* and *without Errors*, is the doubt. And it ſeems yet a greater difficulty, certainly to diſcover *how old* the *Painter*, *Muſician*, *Poet*, *Orator*, or other *Author* was, when he finiſh'd any one piece of his Works, unleſs a man is plainly told ſo : This being a ſort of Knowledge, that thoſe who have been otherwiſe ſufficiently experienc'd in their ſeveral Arts and Profeſſions, have not as yet pretended to.

III. *An Account of a Perſon deceaſed of a Scirrhous Tumor in his Breaſt.* *By Mr* Tho. Greenhill, *Surgeon.*

MR. *J. D.* departed this Life the firſt of this inſtant, and was ſuppoſed to dye of a Conſumption; foraſmuch as 14 months before he had been violently ſeized with an Inflamation of his Lungs, accompanied with a ſharp Feaver, Difficulty of Breathing, Cough, acute Stiches, and Pleuritick Pains, with a ſpitting Blood, *&c.*

He was bled largely in the beginning; and often repeated it during his Sickneſs: continually taking ſuch proper Remedies, as were preſcribed him. But notwithſtanding about *Eaſter*, there appeared a Tumour on the Breaſt Bone, Pap, and Pectoral Muſcle, of the Left Side, with a fulneſs under the *Axilla:* From whence there was conjectured to be a collection of Purulent Matter in the Cavity of the *Thorax*, and that the *Sternon* was foul. The firſt from the aforeſaid Tumors, and his ſpitting a bloody and purulent Matter,and the latter from the riſing and inequality of that Part. But opening him the third of this month, I found his Caſe very different and ſurprizing, which ſeveral judicious perſons that attended him in his ſickneſs, and were preſent when he was opened, can teſtifie. For ſo ſoon as I had divided and removed the common teguments of the *Thorax*, I found, inſtead of a riſing of the Bone with Carioſity, only an oblong tumor, about four fingers in length, and two in breadth, and a proportionate thickneſs, weighing about 3 ounces, it extended itſelf perpendicularly, on the ſuperficies of that part of the *Sternon*, which joyns with the *Cartilago Enſiformis.* I ſeparated it with my Knife, eaſily, from the Breaſt-bone, and found it to be of that ſort of Wens or enciſted Tumors called *Atheroma*, containing a pappy ſubſtance like ſodden Barley. Next appeared a very large tumor on the Left ſide of the *Thorax*, covering the whole Pap and Pectoral Muſcles forwards, with a fulneſs under the *Axilla* of the ſame Arm. Then opening the *Thorax*, I found the ſame Tumor comprehending the Intercoſtals, *Deltoides*, *Subclavian*, and *Subſcapulary* Muſcles, and the whole Axillary and Mamillary Glands, which being obſtructed, and its Veſſels replete with a creamy pappy Matter, more thick and white than the former, there was produced ſuch an induration of the aforeſaid Glands and Muſcles, which compoſe the upper part of the Breaſt, that it may more properly be eſteemed a Schirrous.

The ſame tumor on the outſide of the Breaſt was ſomewhat bigger than ones Hand, extending it ſelf from the Clavicle to the lower part of the Pap; and laterally from the Baſis of the Muſcle quite under the Arm-pit. Internally it poſſeſſed a third part of the Cavity of the Breaſt, crouding the Left Lobe of the Lungs to the Right Side, and in its upper part firmly growing to it; which it likewiſe did every way to the Intercoſtal Muſcles. It was about the bigneſs of a Penny Loaf; and the whole Tumor being conſidered together, might reaſonably be allowed to weigh between 3 and 4 pounds, which being cut into, there ouzed out of it, like an expreſſed Sponge, a great quantity of thick, white and pappy Matter: And what is more particularly remarkable, there was form'd a large Sink or *Pelvis*, in the middle of the Axillary Gland, which contained a thinner and diſcolour'd Matter, and had a free Communication to the Veſſels of the Lungs in the upper part of it, where I told you before it was united; and from hence it was that he generally found eaſe when he had ſomewhat emptied it by large expectorations, and that he could ſo exactly perceive, when any thin Rheums or

Matter flowed to the part: And it was here only that the Lungs were black and replete with ſtagnated Blood, and ſome Globules of the aforeſaid Matter in its *Veſſiculæ*. The reſt of the Lungs were pretty clear from any Ulcers or Matter, but of a Sublivid Colour, and ſtrictly adhered on both ſides to the *Pleura*, but particularly on the Left ſide, all about the Schirrous Tumor. The *Veſſica Fellis* or Gall Bladder was full of Stones, of the bigneſs of a Runcival Pea, and conſiſted moſt of odd Angles, and were formed of a thick Viſcous Sediment of Gall (which we found in it) from an obſtruction of its Veſſels, or Jaundice, which he had ſome years before: They were in number 22, ſome triangular, quadrangular, quincuncial, *&c.*

There was nothing more remarkable, beſides a *Maraſmus* of the External parts, the waſhing of the Call, and emptyneſs of all the *Viſcera* and Blood Veſſels in general.

IV. *An Abſtract of a Book, Entituled,*

Olaui Rudbeckij, Atlanticæ *ſive* Manhemij *pars ſecunda. In qua Solis, Lunæ & Terræ Cultus deſcribitur, omniſque adeo ſuperſtitionis hujuſce Origo parti* Sueoniæ *Septentrionali, Terræ puta* Cimmeriorum *vindicatur, ex qua deinceps in orbem reliquum divulgata eſt, &c. Accedunt demonſtrationes certiſſimæ, quæ Septentrionales noſtros, in maxime genuinum Solis ac Lunæ motum, indeq; pendentem accuratiſſimam temporum rationem, multo & prius & felicius quam gentem aliam ullam penetraſſe declarant.* Upſalæ. In Folio.

THis Learned Author, in this his ſecond part of his *Atlantica*, or *Manheim* [*See an Account of the firſt part in Dr* Hook'*s Philoſophical Collections, Numb.* 4.] has continued to oblige the Learned World with a farther egregious Illuſtration of the Northern Hiſtory and Antiquities, performed by no man as he has done. He divides this great Work into 11 Chapters. In the firſt he ſets forth, that the Iſland *Atlantica* was neither feign'd by *Plato*, nor that it was *America*, nor *Africa*, nor the *Canary Iſlands*, nor that it was drown'd in the Sea, as many have thought, but that it's *Sweden* itſelf ; which tho he conceives to have already made forth by more than a hundred diſtinct ſigns or marks, not ſo fitly applicable to any part of the World whatſoever as to *Sweden* ; yet foraſmuch as beſide the things already alledg'd by him, there are found many things in the Writings of the Ancients, both of his own Country and Foreigners, hid under the Veils of their Learned Fables, which make greatly for the Illuſtration of this Argument, and for which there was no room in his firſt part, he has thought it fit and neceſſary to add ſomewhat of theſe here; premitting ſome things concerning the genuine way of drawing Truth from the Fables of the Ancients. Wherefore in his ſecond Chapter he ſpeaks of the Poetical Elogies of the Antient Poets, of the difficult explication of them, and of the genuine ways of explicating them. Firſt then he ſays it's generally known it was a thing commonly in uſe among the Ancient Writers, to explain, in a Poetical way, the origine of the World, the Deluge, the more famous changes of things in the World, Wars, Marriages, and other affairs of great moment: And this, that theſe things might be read with the greater pleaſure, and ſtick more tenaciouſly in the Readers Memories: he quotes many places of the Ancients abetting this poſition, and aſcribing the Origine of Fables to the *Thracians*, and *Samothracians*. He ſays that *Orpheus*, who was alſo a *Thracian*, divulg'd the ſame Fables to the *Ægyptians*, *Greeks*, and others; and that, in his *Argonauticks*, he profeſſes himſelf to have learnt theſe things from the remoteſt Northern parts: But that after the *Trojan War* the Learned World began to be ſo blind in the ſearch and diligent examination of this kind of Writing, that Learned Men, ſtudious of theſe matters, have been driven into various and very contrary ſentiments. Some, whatſoever they found in the Fables of the Antients, thought ought to be drawn to the Sun, Moon, Stars, *Æther*, Sea, and the like. Others thought the Manners, Virtues, and Vices of Men were delineated after that manner. *Huetius* thought moſt part of the *Jewiſh* affairs were comprehended in thoſe Fables, and therefore he judg'd, in the Writings of the Poets, he could ſee the Shadows, or Images of the things done by *Moſes*, the Patriarchs, and Prophets. After him *Jacobus Hugo* thought the Fables of the Antients were to be apply'd to the affairs of our Saviour *Chriſt*, and the Apoſtles, and thought it not abſurd to give *Chriſt* the Names of *Hercules*, *Mercury*, *Apollo*, and *Jaſon*; to the Virgin *Mary*, the Names *Maja*, *Alcmena*, *Venus*. The Name of *Æneas* to *Peter*, of *Pollux* to *Paul*, and other Names of Pagan Deities to others of the Apoſtles. But, ſays our Author, It is not here the buſineſs, whether any man may efface, or give to another a foreign Name, when both have the ſame Virtue and Fortunate Succeſs: But the point of the matter lyes in the true Country of the Gods, that is, of the firſt Kings of the North, and their paſſing thence into the reſt of the World, and in the ſearch of the true Origine of their Names; which he conceives fairly to have made appear to be *Gothick*. And he gives what follows, as a more ſafe Guide to all Searchers into Antiquities.

1. That a man renders that Tongue familiar to him, in which are comprehended the things done by the *Heroes*, Kings or People to be deſcrib'd: for ſince each man has got his firſt Titles or Praiſes in his Country Language, when theſe are brought to Foreigners, unleſs they are accurately underſtood, they will precipitate men, how learned ſoever otherwiſe, into moſt groſs errors. Of this he gives an Inſtance in the word *Jupiter*, whoſe force and ſignification being underſtood by few *Greek* and *Latin* Writers, they interpreted it various ways; whereas it's only their Country that has retain'd this word as a Regal Title, from the moſt remote memory of their Anceſtors, the *Gothick* word being *Jofur*, *Jo* denoting the Earth, and *Fur*, or *Fadur*, Father, Prince, or King.

2. That a man read with diligence and accuracy all Authors that are to be gotten, and compare them together.

3. That he faithfully and ſoberly inſpect the Argument itſelf, it having been uſual with the Poets to ſport themſelves with divers Significations of the ſame Word, as the nature of the Argument required, of which he gives ſome Inſtances.

In his third Chapter he treats of the Fables of the *Scalds*, that is, of their Poets, which, together with their Gods, that is, with their Kings, paſt to the *Greeks*, *Ægyptians*, *Lybians* and *Aſiaticks*. To make out this, he tells us of a great familiarity there was betwixt *Abaris* the *Scythian*, and *Pythagoras*; that the former made a Voyage from the utmoſt parts of the North to the latter, and taught him many *Arcana*, many things alſo concerning the Superſtition and Sacrifices of the *Hyperboreans*, and concerning the Origin and Genealogy of their Gods. And ſays that *Pythagorus*, *Homer*, *Heſiod*, and others of the *Greeks* had viſited the remote Northern parts. And as neither the Gods, nor the Names of the Gods, nor the Fables concerning them, belong to the *Greeks* as the firſt Authors and Inventers of them, but that all theſe, by the Confeſſion of the *Greeks* themſelves, came from the *Barbarians*, or *Hyperboreans*, to them, and other Nations.

So he here exſtracts a good part of the Fables from the *Scalds* and other Northern Monuments, and ſhews what anſwers to them in the fabulous Hiſtory of the *Greeks*; and having laid before us 75 Fables ſo extracted, he concludes, as even Foreigners have done, that whatſoever there has been of Philoſophy among the *Europeans*, *Aſiaticks* and *Ægyptians* has flowed from the ancient *Hyperboreans*. And that the Names of the Gods and Goddeſſes and their Worſhip came from them to the *Greeks*, and from thence to the *Romans*. And he challenges the whole World to contend with them, concerning the *Atlantick Iſland* on theſe conditions.

1. That they ſhew a like connexion of their Fables with the *Grecians*, as he has here ſhewn of the Northern.

2. That they as fairly bring for themſelves a moſt clear Confeſſion of the *Greeks*, as he has done for the *Hyperboreans*, in this caſe: Which he thinks it impoſſible for them to do, all Nature, a good part of which is ſhadowed forth by thoſe Fables, being againſt them, and forcing them to yield the point to the North; for which he gives ſeveral convincing proofs.

In his fourth Chapter he brings ſome new ſuffrages of the *Scalds* unexplain'd before, and alſo of *Greek* and *Latin* Writers, in this caſe: And after having given us many quotations, he tells us that a certain over great admiration of the Southern World, grown up in progreſs of time, thro an oblivion or hatred of the Northern affairs, had led many Men into Errors, from the true Senſe of the moſt Antient Writers, whoſe Words nevertheleſs they had preſerv'd Religiouſly enough.

In his fifth Chapter, which is large enough to make a good Volume of itſelf, he treats of the *Heliolatria*, or *Sun-worſhip* among the *Atlantiques*, and of its firſt Origin; and afterwards of its propagation thro' *Europe*, *Aſia* and *Africa*. He ſays a Man would hardly think, that all Mankind being deſtroy'd after ſo wonderful a manner, by a Deluge, ſaving *Noah* and his Family, his Poſterity caſting off all fear of a Deity, ſhould ſo eaſily fall into Idolatry, and that within an Age or two after the Flood. But he notes, that as they are Vulgar, however they know the King (whom they ſeldom or never ſee) is to be paid the greateſt Honour, yet they are mov'd much more powerfully at the ſight of his Deputies, Collectors, and other Officers, who are always preſent to them, whom they court with Words, Geſtures and Preſents, as expecting from them a preſent Good or Evil: So the Sons of *Noah* being depriv'd of the Sight and Speech of the Eternal Deity, ſtuck not to fall into an Admiration and Worſhip of things made by him, eſpecially of the Sun, Moon and Earth, which they found to be the Fountains of Light, Heat, and all things neceſſary for the preſervation of the Life of Men and Animals; mean while the Veneration of the true Deity vaniſht. Now, he ſays, thoſe who were ſo ſeated to the Sun, that they were forc'd to be without him yearly for entire Months, and who, inſtead of Light and Heat were forc'd to receive Darkneſs, Cold and Ice, ſo that neither Earth nor Sea were able to produce any thing for the uſe of Men or Animals:

Theſe perſons doubtleſs learnt moſt earneſtly to deſire the benefits of the Sun and the Earth, and to have the Authors of theſe benefits in a greater eſteem and honour, than thoſe to whom the Sun is always equally preſent, and the Earth always produces Fruits; as it is with the more Southerly Inhabitants, who are obſerv'd not to have made ſo great an account of the Sun, or of any of the Gods.]

He proceeds next to ſet forth in order the various names of the Sun, ſhewing that the Names he has among the *Greeks*, *Latins*, and other Nations, have their origin from the *Gothick* Language. Then he tells us of the time of the year formerly famous among them for the Feaſt of the Sun, of their publick mourning at the Sun's departure, of their publick rejoycings at his return, of the motion of the Sun being ſhadowed forth by Fables, of the Sacrifices, and finally, of the paſſing of theſe Sacred Rites to Foreign Nations. To determine rightly concerning the time of the year for the Feaſt of the Sun, he ſays, we muſt firſt know in what part of World the Sun-worſhip began, and then what part of *Sweden* their Anceſtors firſt took to Inhabit: and here he obſerves, that after the Confuſion of *Babel*, Men being diſappointed of ſecuring themſelves from another Deluge, by their Intended Tower, many of them betook themſelves to Mountains, and conſequently to the North, where they had not only a ſecure habitation on Mountains, but had likewiſe the conveniencies of purſuing Game by Land, and of Fiſhing; the Northern part, as being the higheſt, firſt growing dry after the Flood, and firſt generating Animals. And he affirms *Scythia* to be ſo far higher than all other Lands, that all the Rivers there riſing run into the *Mæotis*, *Pontus Euxinus* and the *Ægyptian Sea*: And he confidently affirms that the Rivers *Tanais* and *Volga* were adventur'd on by their Anceſtors, it being certain they went to the *Greeks*, *Armenians*, *Perſians* and *Indians* by thoſe Rivers; and that before this going and returning, according to their Hiſtorians, from the Sources of *Tanais*

and

and *Volga* they came to the *Finland* Coaſt, and having made a circuit about thoſe Iſly Shoars of *Finland*, they made a deſcent upon the Land itſelf, and ſtopt not till they poſſeſt themſelves of the higheſt Mountains of that Country. He adds, that all the Fables of their Anceſtors concerning their Gods, that is, concerning the *Sun*, *Moon*, *Earth*, *Saturn*, *Jupiter*, *Mercury*, and others of their Kings, or of the moſt famous Mountains, to which the Names of their Kings formerly Inhabiting them are left, readily evince that the firſt and moſt ancient Seats of their Anceſtors which came thither, were in the Tract and Mountains beyond the *Toronæſij*. And the præcipitation of the Sun and Moon into *Eridanus* (which he Interprets the *Baltick*) Celebrated by ſo many Writers, and almoſt all the Poets, can agree to no place but theſe very Mountains, and conſequently it aſſigns ſo certainly and firmly to their Anceſtors, the Authors of this Fable, their Seats in thoſe Mountains, that this reaſon alone is convincing with him. To which if we joyn the Teſtimony of the *Runick Calender*, cut on Sticks, it will appear that this very Calender was firſt Invented, and began to be cut in thoſe places, ſince in *Upland*, and the lower parts of their Country ſuch a thing could not be excogitated with due ſucceſs. And as to theſe *Calenders*, they lye under a miſtake who have aſcrib'd the Invention of them to the *Danes*, and Southern *Swedes*, which he affirms to be due to the *Cimmerians*, the moſt Northerly Nation of *Sweden*; from whom the Sun is taken away in the Winter time for 40 days together. In giving an account of the form of the *Runick Calenders*, he preſents us with many Cuts of them, which in a Scheme he compares with the *Calenders*, and accounts of Times, of the *Romans*, *Greeks*, *Ægyptians*, and others, in which he is very large; and thinks he has found out, from the motions of the Sun and Moon, the age and firſt origine of the *Runic Faſts*, and ſo not only the firſt time of the North's being inhabited, but likewiſe the day that *Mundilfarus* began to obſerve the deſcent of the Sun and Moon into the *Baltick Sea:* And conſidering that the *Phænicians*, *Greeks*, *Perſians*, *Latins*, and the *Goths* that liv'd out of their Country, as well as their Anceſtors, us'd Letters for Members, he thinks it is moſt evident that their *Runes* were more ancient than the Letters of all the others; and ſays he has moſt clearly made out that their moſt ancient *Runic Monuments* are of 4000 years ſtanding, *viz.* that they were ſet up and cut with Letters the in 17 hundredth Century after the Creation: Which if it will hold good, we may note, that this comes very near to the time of the Flood, according to the *Hebrew Chronology*, which the Author follows, and utterly refuſes the *Septuagint Chronology*, as to *Epocha's* of the Creation, and Deluge. He obſerves that *Noah* liv'd 350 years after the Flood, *Gen.* 9. 28. that is, to the year of the World 2006. The Deluge happen'd 1656 years after the Creation; and ſo he ſays he finds that *Noah* dyed a whole Age after the *Lunar Circle* was cut in the *Runick Faſts*, and two Ages after the ſame *Faſts* were compos'd by King *Atlas*, according to the motion of the Sun: And ſays the *Atlantick Faſts* were carried by *Hercules* into *Ægypt*, and by *Saturn* into *Tuſcany*, about the ſame time.

He tells us, That, according to the opinion of their Anceſtors, *Ice* or *Iſen* gave a riſe not only to the Earth, but likewiſe to all Terreſtrial and Celeſtial Bodies whatſoever; and therefore their Writers call'd the Goddeſs *Diſa*, alſo *Jis*, and *Iſa*; whence the *Ægyptians* got their Name of *Iſis*.

He ſays, Their Anceſtors gave the Names of their Gods to the 7 days of the week: To their firſt day, from their God *Logius*, that is five, they gave the name of *Logedag*, or *Loje-dag*, as it were, the Day of Five; *Logius* being one of the names of *Saturn*; and in this reſpect this God is to be accounted the Father of Time, and of all things. To the three following days, they have given the names of the three moſt famous Bodies of the whole Univerſe, becauſe they ſaw the Riſe, Increaſe, Life aud Motion of all Terreſtrial Bodies to depend of them: and therefore they call'd the ſecond day of the week *Sondagh*, the third *Mondagh*, the fourth *Tiſdagh*, the day of *Diſa*, or the Earth. As for the reſt of the days, they call'd them by the names of their three greateſt *Heroes:* The fifth day of the week, *Odenſdagh*, from *Odinus*, or *Atinus*, the Deity of War both by Land and Sea; that is, performing the parts both of *Hercules* and *Neptune*: The ſixth *Torſdagh*, from *Thorus*, or *Jupiter*, the chief Judge and Lord of the Earth: The ſeventh *Fredag*, from *Freia*, the Wife of *Jupiter*, not only the Goddeſs of Wedlock, but likewiſe Queen of the Northern *Amazones*, under whoſe conduct and example they learnt to handle both Diſtaff and Arms.

The word *June*, he ſays, in their Language, ſignifies a whole, or round thing, and that from thence the *June Feaſt* is ſo call'd, becauſe it follows the converſion and return of the Sun to their Anceſtors, having been ſome time abſent from them. And he gives an account of the Sports us'd at that Feaſt, much anſwering to ours at *Chriſtmas*; and of the Sacrifices then us'd: And ſhews that many of the Poets Fables are in their nature ſuch, that they cannot be apply'd with the like ſucceſs to any foreign Kings, Commanders, Places, or Heaven. He obſerves, as often as Learned men have aſſerted *Oſiris* to be the Sun, they made his Country without all heſitation to be the North, ſince they could not get the fiction concerning the Sun's Country, but from the North itſelf: for ſince the Sun is not on the Earth, whatſoever is read concerning his Country on the Earth, muſt be referr'd to certain ſights or aſpects of him, as alſo to the kinds or points of his riſing or ſetting in the *Horizon*, inhabited by this or that Nation; and ſo in this reſpect the North was ſaid to be the Country of the Sun, becauſe there he ſeem'd to have found ſome reſt or refreſhment from his labours. And he ſays many Fables for theſe cauſes are not only explain'd unſucceſsfully, nay, ridiculouſly and uſeleſsly, as many learned men confeſs; but alſo have lain neglected even to this day, for about 40 Ages. To wit, No Man has took upon him narrowly to inſpect Nature itſelf, the North, the Poems of the *Scalds*, the aſpect of the Sun and Moon in thoſe Northern places, or the wonderful turns and changes of the Earth, Sea, Heavens, and Seaſons there, wholly unknown to *India*, *Ægypt* and *Africa.* Therefore he here takes upon him to prove that all Fables of this kind were invented to repreſent the motion of the Sun in theſe places, and afterwards carried to *Ægypt*, and withal to draw forth their genuine ſenſe, both from Nature, and the proofs of the Learned. He tells us from *Herodotus*, the *Greeks* were commanded by the Oracle of *Dodona* to preſerve religiouſly all the various names of the Gods, brought to them by the *Hyperboreans*; nor was it any way lawful for them to change ſuch for *Greek* Names. And here, as well as generally throughout his Book, he makes out from the *Etymology* of the Names of the Gods, Heroes and other things relating to them, that they generally own a *Gothick* Original. And ſays the deſign of their Poets ſeems as learned as elegant, who, ſeeing the Nature, Names and Number of Perſons to agree with the Names and Number of Things themſelves, that theſe ought to be ſo joyn'd and fitted together, that they might ſeem to agree together alſo in their very Names; of which he gives ſome Inſtances.

For rightly underſtanding the ſenſe of their Fables, he ſays, we muſt conſider it was uſual with the *Scalds* to notifie one and the ſame God, or King, with many Names in the ſame Fable, which Names nevertheleſs may be reſtrain'd by ſome common ſign to ſome one perſon. Secondly, We muſt know and hold in general, that there are three mighty Bodies in the World, which were chiefly heeded to by fabulous Antiquity, employ'd in Inventions or Fictions, *viz.* the Earth, Moon and Sun; and that nothing more ſtrongly vindicates the Invention of theſe Fables to the

North, than their primary and only end, which is nought but to ſhadow forth the preſence, abſence, riſing and ſetting of the Sun and Moon, as they happen in the Northern parts; where one while theſe two Planets ſeem to ariſe and begin their courſe, and labours from the Mountains and Woods, another while to return, and hide themſelves in the ſame places, as it were, for ſleep and reſt. Tho it has ſeemed good to ſome Northern Poets, to delineate that great and Winter ſetting of the Sun, by his deſcent into, or drowning in *Eridamus*, and to joyn the mourning and ſorrow of the Gods with that misfortune.

The Fable of *Deucalion* and *Pyrrha*, he ſays, is owing to their Anceſtors; as the confeſſion of Foreigners, who call *Deucalion* a *Scythian*, and alſo the nature and origines of the Names, in the *Gothick*, *Daffkallens och Burras* make manifeſt. *Daw*, or *Daff*, in that Tongue ſignifying moiſt, dewy, watery; and *kalle*, a man; ſo that *Daffkale*, *Deucalion* denotes an Aquatick man, or a man concern'd in Waters, or a Deluge: And ſo *Pyrrha* deſcends from the *Gothick* word *Burra*, or *Byra*, that is, the Mother of many Children. And he ſays Writers generally own that in theſe Fables *Noah* and his Wife are ſhadowed forth; and that the *Scalds* call the ſame not only *Daffkalle*, *Deucalion*, but alſo *Berghtelmer*, *Bure*, *Man*, *Thor*, *Joſur*, and by other names. Upon the whole, he applys this whole ſtory to the Sun and Moon, their Couching in the Sea, and their return again.

In giving the Etymology of the word *Proſerpina*, he ſays, it was uſual with their *Scalds*, in framing or compoſing Names, to uſe words that have more than one ſignification, tho making ſome way to the thing; and that chiefly for this reaſon, that in one Name a whole Sentence, in a manner, might be ſeen and read.

He ſhews, that, as the Sun, in the Ancient Fables was ſhadowed forth under ſeveral names; ſo, among others, in the *Scalds*, and their Hiſtories he was ſhadowed forth by *Fogelen Fanin*, that is, the Bird *Fanina :* And that when this Fable came to the *Greeks*, of the name *Fanina* they made *Phœnix*, concerning the Age of which there is a general contention. *Pliny* counts 660 years for the ſpace of his life, ſometimes 640, ſometimes 360. *Ovid* and *Herodotus* 500 years, *Lactántius* 1000, *Sobinus* 540, *Voſſius* from *Tacitus* 1461, *Johnſtonus* from *Albertus* 350, *Salmaſius* 300, *Tzetzes* computes 7006 days for his age. But a *Scald*, a Poet of theirs, defines the age of the Bird *Fanina*, or the *Phœnix*, to be 3 0 days ; and *Furi* a *Scald* makes three differing ſpaces of his life, one of 300 years, another of 1461, another of 6940 : the years here being to be taken for days, after the moſt ancient Cuſtom. And whereas the firſt Age of the *Phœnix* is ſaid to be 300 days, and that he lyes hid as dead 65 days, this denotes that the Sun is ſeen each year by the *Cimmerians*, at 69 degrees latitude, 300 days, and that he is wanting 65 days. The 2d way computes 1461 years, or rather days, which muſt be thus underſtood ; the Sun not clearly returning each year to the ſame point of Time, or of the Heavens, and ſlower than expected from the Eaſt, they found it neceſſary to gather one day from thoſe little parts of Time, and to add it to each fourth year, which they call the Leap-year, explicating this little ſtay, in the Fable, by ſomewhat a larger death of the *Phœnix*, or a more ſlow than fit generation of the Vermicle from the Aſhes. For a clearer proof of this, 365 days 4 times numbred, make 1460, to which if you add that one day inſerted, the whole will be 1461. The third way giving 40 days to the Age of the *Phœnix*, depends on this ; that they ſaw the Sun return to himſelf various days and hours of the increaſing or decreaſing Moon, till 19 years had paſt, which being over, the points of riſing and ſetting return'd to their former moments of times ; hence therefore, that is from 365 days nineteen times repeated, and gather'd into one ſumm, and alſo the five *dies Intercalares*, or Inſerted days (for ſo many in a manner ought to be numbred within the ſpace of time) being added to that ſumm, a certain new ſpace of Life, *viz.* of 6940 days ariſes to the *Phœnix*, in this Fable of our Anceſtors. And he does not wonder that other Writers have generally err'd from this true account of time, becauſe they ſeem neither to have known the Fable itſelf, nor the account of years whence this Age of the *Phœnix* is manifeſted.

He ſays, it has always been accounted a thing very agreeable to the purpoſe of the *Scalds* and Poets, in their Fictions, to compoſe of the parts of ſeveral Bodies, thoſe things whoſe Attributes, or Offices they ſaw differing: Therefore they made a Plough-man with a Man's Head and an Ox's Body, becauſe in Ploughing a Man drove an Ox before the Plough-ſhare: And compoſed a Horſeman of a Horſe and a Man, and a Seaman of a Man and a Fiſh; that we may know him to be a guider of an Horſe in the Field, this of and a Ship in the Sea. As therefore they made *Neptune* of a Man and a Fiſh, ſo they did *Jupiter*, the Father of the Earth or Country, of a Man and an Ox, as a good Plough-man; and *Mars*, of a Man and a Horſe: And wholly the ſame way is kept in forming the Images of the Cœleſtial Bodies, to whoſe both motion and nature the Authors of Fables moſt diligently attended. And the Art and Induſtry of the *Scalds* ſhews itſelf particularly in this, that they undertook ſo to compoſe and adjuſt the Lives and famous Acts of their *Heroes*, with the Nature, Virtues and Motion of the Cœleſtial and Terreſtial Bodies; that on a due application, we may be no leſs able thence to learn the Genuine Nature and diſpoſition of theſe, than the Hiſtory of thoſe: All Learning, according to the way of thoſe times, for certain reaſons, ſeeming to have been involv'd in Fables.

THe ſixth Chapter treats concerning the *Northern Geolatria*, or *Earth-worſhip*, diffus'd in proceſs of time, thro' the reſt of *Europe*, *Aſia* and *Africa*. Here the Author tells, that as the *Sun-worſhip* had its firſt riſe in the Northern parts, ſo had likewiſe that of the Earth, which he here makes forth at large, and ſays, as to the Names of the Earth, that as the *Greeks* and *Latins* own the Worſhip of the Earth to have been brought to them from Foreign parts, ſo alſo they admired various names of the ſame, as barbarous and foreign to their Tongues. To paſs by, that as often as Learned Men have endeavour'd to draw ſuch names from the *Latin*, *Greek*, *Ægyptian*, or other Languages, they have wholly loſt their Labours; the chief name given the Earth, he takes to be *Ida*, or *Eida*, which in the Ancient *Gothick* ſignifies Mother, and this not only for that it's ſo us'd, but in the thing itſelf, it being deducted from *Idug*, diligent and laborious as Mothers ought to be; and as we call in the Modern *Gothick*, a Mother *Moder*, from *Moda* Toil and Labour, which it's manifeſt do not ſo much follow the Office of a Mother, as fulfil it. He ſays alſo, that from *Ida*, or the Goddeſs *Iduna*, the Mountain *Ida* had its name, and not the Goddeſs from the Mountain, as ſome have thought; for Mountains, Cities or other places could not get their names but from Gods and Goddeſſes; at leaſtwiſe we may not think or conclude any thing concerning certain names of Mountains before Gods or Men. If any ſay that many men have got their Names from their Seats or Places of Abode, and conſequently often from Mountains; yet nothing hinders but the Names of ſuch Places, Mountains or Seats were taken from other Men, *viz.* the firſt, or the Inventors of Names, and from the Inhabitants or Poſſeſſors of Places. And next, the Author proceeds to give Etymologies of other Names given the Earth: He ſays, it ſeems incredible and abſurd to many that *Heſiod*, *Homer* and *Orpheus* were ever ſo diligent, faithful and fortunate ſearchers into the Affairs that were either tranſacted, or recorded in Writings in the North, or that in their Writings they ſet upon the Hiſtory or Expoſition of things ſo remote: Therefore he takes upon him here to ſhew what the moſt ancient of the *Greek* and *Latin* Writers have teſtify'd concerning theſe very Poets, and whence men ſo famous throughout the World drew their riſe: And proves by the Teſtimony of *Suidas* and others, that *Linus*, *Orpheus*, *Heſiod* and *Homer* deſcended from the *Hyperboreans*. And, he ſays, that even to this day, among the moſt Northerly Inhabitants, among which he counts the *Iſlanders*, the love, ſtudy and care of preſerving the Books of their Ancient Genealogies, and the Monuments left them by their Anceſtors, is ſo great, that it's eaſily ſeen they prefer them before Silver and Gold. No wonder then if the Poets before mention'd labour'd to propagate to Poſterity the names of their famous men of ancient Ages.

He tells us, their Anceſtors thought *Ice*, or *Siſen*, to be the firſt Matter of all things, or, if you had rather, the principle, or firſt *baſis* of them; which having a deadneſs of itſelf, the Fire, moving and agitating all things by its force, frees it from its dead ſort of State, and having divided it into moſt minute Particles, compoſes and ſets it in order again after various ways: And he conceives they were led into this opinion from their general cuſtom of beginning the year in the Winter; at which time the Sun and Moon paſſing under the *Horizon*, and darkneſs prevailing, whatſoever was there Watery was turn'd into Ice; the Earth being cover'd with Ice, became as hard as Rocks; the Reptiles, Inſects, and a good part of the little Birds lay benumm'd with Cold in their Neſts or Caves, the other Birds flew away to other Countries; and, in ſhort, all the

Plants in general were wholly overwhelm'd with Ice and Snow; and therefore they judg'd this ſo general a reſt of all things very much to reſemble, not only Death, but even Nothing itſelf: For whatſoever is void of Motion in theſe Earthly things, can neither change itſelf, nor produce any other thing. Therefore they made *Ice*, by which they ſaw the Earth and Waters converted into moſt hard and immovable Rocks, and all the warmth of the Air, and the life of the reſt of things to be extinguiſht and deſtroy'd, as the Mother, Matter, and Firſt Principle in producing all things. And when upon the Sun's return they ſaw the Ice, how hard ſoever, to be melted and reſolv'd into Water by the force of Heat, they lookt upon Heat, as a Principle endued with a great power of acting and moving, (but foreign, and coming from the Southern World to the North) becauſe being joyn'd with Ice, their Northern and Domeſtick Principle, it produc'd Water, which, after this manner, they not unfitly call'd, the Daughter of Ice. Again, as Water, whether it flow'd over the Earth, or ſtagnated, or were kept in a Veſſel, always depos'd ſome thin or groſs Mud to the bottom, ſo they call'd Earth the Daughter of Water: And ſeeing Plants and Fruits to grow from Earth a little dry'd, they call'd theſe the Daughters and Offſpring of the Earth, and aſſign'd other riſes to other things. Now he ſays the Southern World could not pretend from their own Invention, to excogitate ſuch a riſe of things, they having no ground in Nature for it, but had it from the North, it being teſtified not only by their *Scalds*, but likewiſe by other Writers, that whatſoever *Orpheus*, *Heſiod* and *Homer* ſay concerning the origine of the Gods, they had it thence: He adviſes us alſo to note, that men ſtudious of Natural Knowledge and Aſtronomy began to be call'd by the names of thoſe things whoſe Nature, Motion, or Powers they ſearcht into; wholly after the ſame manner as *Mundilfarus* was ſaid to

be

be the Father of the Sun and Moon; a name compounded from *Mond* the Moon, *Ell* the Sun, and *Far* Father, he being a famous Aſtronomer.

He tell us, that *Norland*-Fowlers, ſeeing flocks of Birds coming to them yearly from *Finland* and *Muſcovy*, make a great gain of them: for above 600 Cart-loads of Birds then taken and kill'd, are wont to be ſent from *Norland* into *Sweden* in the Winter, nay, to the ſole *Metropolis* of *Sweden*, *Stockholm*: At which time their Fleſh becomes ſo hard, that they receive no taint from the Putrefaction for two or three months, whereas at other times they can ſcarce be kept two or three days from ſtinking. As to the flying away of thoſe Birds, they are wont to begin their flight in the months of *September* and *October*, for the moſt part without danger: But if they chance to delay it till *November* or *December*, it's often diſturb'd and interrupted, not only by the ſhortneſs of the Day-light, but likewiſe with moſt thick Fogs riſing from the *Baltick*: For, falling into Darkneſs and Fogs in their flight, they firſt loſe their way, and at length, being tir'd with continual flying, they fall into the Waters, their Bodies being found in heaps, driven to the Shores.

Speaking of *Iſis*, or *Io*, he ſays their Anceſtors call'd the Earth a Cow, and made its Images in the form of a Cow, becauſe, as among Animals, the Cow alone ſupplys Milk in a due quantity for humane uſes, ſo the watery part of the Terreſtrial Globe ſerves moſt of all for the production of all things, and ſo from this Northern Cuſtom and Worſhip of *Iſis* the *Ægyptians* learnt to Worſhip *Iſis*, or *Io*, and to look upon Cows as ſacred.

He ſays, that tho the firſt Author of *Earth-worſhip* gave the Earth ſeveral Names and Titles, as of *Io*, *Troia*, *Frigga*, *Iſis*, *Terra*, *Ceres*, and many others, yet the Name of *Dia*, *Diana*, or *Diſa*, which ſignifies a Nurſe, was the moſt common and ſolemn name of all, given her becauſe ſhe ſerves for feeding and nouriſhing Mankind: And ſays their Goddeſs *Diſa*, of whom he has given Cuts, was repreſented with a Net about her, to intimate the Invention of Fiſhing and Fowling, which have greatly contributed to Man's ſubſiſtance. And in reference to Fowling he ſays, It's very well known that no where better *Hawks* or *Falcons* are to be had, than in the moſt Northerly parts of *Sweden*, *Norway*, *Iſland*, and *Muſcovy*; whence they are wont to be carried to the Kings and Princes of the Southern World, *viz.* of *France*, *Germany*, *England*, *Spain*, and even to the *Ægyptian*, *Perſian*, and *Indian* Kings and Rulers.

He tells us, their Anceſtors held the Immortality of the Soul, and that in their Monumental Inſcriptions they were wont to pray to God, *Thorus*, *Odinus*, *Iſis*, *Ida*, or other Deities, to preſerve the Souls of the dead, and this long before Chriſtianity was introduc'd among them.

He tells us of wonderful performances, ſaid to have been wrought by the means of their *Scipio Runicus*, or *Runſtaff*, being anointed with a certain Magical Ointment, *viz.* of Men's flying in the Air on it, and the like. And ſays a more conſtant fame of nothing has remain'd in their Country from the remoteſt times of Paganiſm, than of ſuch flights in the Air; and that nothing is more readily believ'd, than that the preſent *Laplanders*, who continue ſtill in Paganiſm, uſe the ſame kind of flights now: And that beſide *Runſtaffs*, Sticks, Poles, Calves, Horſes, Dogs, and other living Creatures, anointed with the ſame kind of Ointment, were thought to be able to carry their Riders to places deſign'd. And theſe things were wont to be aſcrib'd to *Diana*, or *Diſa*, as the firſt Inventreſs of them.

He tells us, they aſcribe the Origine of their Letters to *Iſis*, and ſays their *Scalds* call'd the firſt Letter *Iſen*, that is *Ice*, the Foreigners *Iſis*. For when the Earth, the Niece of *Ice*, or *Iſis*, after ſhe began to be call'd and worſhipp'd with the Names of her Grandmother, *viz.* *Iſis*, and alſo *Diſa*, *Dis*, and *Diana*, then likewiſe was abſcrib'd to her that obſervation, by which the firſt forms of Ice upon freezing were diſcover'd, after the manner of which ſhe afterward began to draw Letters. Now Water upon freezing into Ice, firſt diſcovers a certain ſtraight line, after the Imitation of which the Letter [I] is form'd, with one ſingle ſtroke, which they call *Is*, *Iſis*; afterwards, at the ſides of this ſtraight line, on both parts, there come tranſverſe Icy lines, which they call *Kna*, *Knees*, and from which Pattern *Diſa* began to form all *Runick* Letters whatſoever, as being compos'd of meer ſtraight and tranſverſe lines, *viz.* of *Is* and *Kna*, that is, *Iſis* or *Ice*, and *Kne.*

He ſays, the *Tympanum* of the Mother of the Gods, ſo much Celebrated by *Greek* and *Latin* Writers, tho explain'd by none of them, as it ought, was nothing but a Copy of the *Lapland Tympanum*, convey'd to foreign parts by *Diſa*, *Iſis*, *Idæa*, or *Diana*, whoſe *Ring* and *Hammer* were ſome time found in the Left Hand of the Figure of *Iſis* at *Rome*, the *Tympanum* itſelf being over the Head of the Goddeſs, and there being marks under her Feet like to thoſe that are ſeen in the *Lapland Drums*. The *Ægyptian Iſis* alſo, according to a Cut given of her by *Pignorius*, holds this *Ring* and *Hammer* in her Left Hand. And the Mother of the Gods (as *Du Choul* has ſet her forth) handles a *Tympanum*. And he thinks he has given much light to the *Tympanum* of *Cybele*, from that ſtrange Superſtition of their Anceſtors, which reigns ſtill in ſome parts of *Lapland*; and ſays in his *Chronology*, he will make out that the Daughter of *Inachus* going into *Ægypt* a little before the time of *Moſes*, taught the *Ægyptians* Incantations, and withal ſhew'd them that infamous abuſe of the *Hieroglyphical Marks*, with which Arts the *Ægyptian Magi* afterwards contended with *Moſes* before *Pharaoh*; tho he does not think that all the *Goths* were given to thoſe Arts, for that the Teſtimonies of Hiſtories, the *Scalds*, and of *Snorro* himſelf, free the moſt valiant of the *Goths* from that Infamy, thoſe Arts being beneath their Valour and Dignity, and ſeem'd much to prejudice the Fame and Renown due to valiant Men, and therefore great puniſhments were inflicted on Men given to ſuch Arts, by Magnanimous Kings.

He ſays that their Anceſtors were fully perſwaded that the Waters proceeded from Ice, the Earth from the Waters (as is intimated before) and the Sun and Moon from the Earth and Waters, and conſequently that theſe two Planets were Off-ſprings of the Sea and Earth; and for confirmation of this matter they laid down theſe four Poſitions; That the Sun and Moon in the production of this Univerſe, were poſterior to the Earth; that in the remoteſt part North, dark for many months, firſt the Moon, and afterwards the Sun emerg'd from *Evidanus*; That ſometimes diſplaying their Rays among the Clouds to the ſurface of the Sea and Earth, which Rays are conſpicuous enough in a foggy Air, they were ſaid by their vulgar to take their Food from the Sea and Earth: And laſtly, That according to the common opinion of the Antients, thoſe two Planets are ſaid to have been carried in Ships. Now, he ſays, the *Greeks*, *Latins* and *Ægyptians* delivered indeed ſuch like things, but without a reaſon; nor could they be look'd upon as the Inventers of ſuch Opinions; for the Sun and Moon never ſo receded from them, that they might ſeem to be reborn, or to emerge from the Sea at ſome place, after an Interval of time, to their admiration, which is the moſt fertile Mother of Judgments and Opinions.

He tells us, as the Prieſts of the Earth were bound to caſtrate themſelves with Knives of Stone or Flint, in honour of the Sun's paſſing under the Earth, and having depos'd his Power of generating in the North; ſo they were bound to cut their Hair and ſhave themſelves in honour of the Earth, be it of Flowers, Leaves and the reſt of its Ornaments: And tho' the *Chaldeans*, *Greeks* and *Ægyptians* obſerv'd the ſame Rites, yet the Prieſts themſelves, to whom the care of theſe Sacred Myſteries were committed, ſcarce underſtood what they meant, and ſo they own'd them to be rather Foreign than Domeſtick Rites.

He ſays, they have a Fable which tells us, the Deity of the Earth waſhes herſelf in the River *Almon*, on the 6th of the *Calends* of *April*; for at that time their Earth throughout ſwims, as it were, with Floods, which the Snow melted by degrees by the heat of the Sun, diffuſes thro all places, and Rains ſometimes ſo encreaſe them, that no part of their Earth may be accounted free from them; and the *Gothick* Language call theſe Land Floods, *Almanne-flod*, that is, an univerſal Deluge, whence the *Latins* have made *Almonem Fluvium*: The word *Alman*, ſignifying Univerſal, Common, Publick.

He tells us, That *Homer*, *Pliny*, *Herodotus* and others, call the *Hyperboreans*, the moſt Wiſe, Juſt and Prudent of Mankind, and that *Plutarch* ſays, a Man may there much more ſucceſsfully advance himſelf in the Study of *Aſtronomy* in a month, than elſewhere in a very long ſpace of time.

The Seventh Chapter treats concerning the Rape of *Proſerpina*, and of the firſt coming of *Ceres* into *Sweden*. Here the Author ſets forth, that in the Southerly parts of the World *Agriculture* always flouriſht, Fruits alſo in many places growing of their own accord, and conſequently that the Inhabitants of ſuch places, were the leſs mov'd to admire ſo eaſy and uſual a thing, much leſs could be ſtirred to Worſhip the Earth, as a Deity to be ſollicited with Prayers. On the contrary, that the Northern parts were formerly wholly without Fruits, and that even now Deſarts, Woods, and many Fields admit no cultivation, or at leaſt produce no Fruit without cultivation and ſowing. That inſtead of Corn at that time they had three Subſtitutes, to which poor people even now are wont to have recourſe, *viz.* The ſappy outward parts of the Pine and other Trees, which were wont to be taken off in the Spring, to be dry'd and pounded to Powder. 2dly, Acorns, now given to Swine, but then guarded with accurate Sanctions of Laws. 3dly, The Roots of *Filipendula*, which were of a grateful ſavour, and Food for the beſt Perſons, and now greedily hunted after by Swine, who root up the ground for them. But as ſoon as their Anceſtors came to know there was a more plentiful growth of Fruits in the Southern Countries, it appears, from the Hiſtory of *Adonis*, that he went forth of their Country, and took by force from elſewhere a Kings Daughter, who greatly delighted in *Agriculture* and Gardening, and brought together with her thoſe Arts and Studies into his Country. Now the firſt name of this Virgin among them, he ſays, was *Korve*, that is, Grain, or Seed, becauſe ſhe taught them how to ſow, called by the *Latins*, *Ceres*, the ſame name being given her Mother; and then he tells us, how ſhe came by the name, *Proſerpine.*

To make good what is ſaid of *Adonis*, he ſays all agree that a certain King formerly took away a Virgin by force, and married her. The *Scalds* call him *Oaden*, the *Greeks* *Aedeſs*, and *Aidoneus*; the *Gothick* Writers, *Bluter*, the *Latins*, *Pluto*: Again, ſome of theirs call him *Theyſſe*, and *Wejofur*; foreign Writers *Dis*, and *Vejovis*. In this ſo great diverſity of Names we ſhall beſt know who he was from his Country and Kingdom: For ſince he is call'd by all the King of Darkneſs, he muſt be Northern; and for the ſame cauſe he is call'd *Rex Manium*, the King of Ghoſts, *Manheims Kong*, and *Rex Orci*, *Joroens Kong*, and *Rex Acherontis*, *Agronders Kong*, *Rex Eleuſinorum*, *Glywalos Kong*, *&c.*

He reflects on the Opinion of *Wormius* and others, as Childiſh, by whom the affairs of the *Goths* Feaſt *Juul* are ſaid to have had their Name from *Julius Cæſar*; for that all thoſe things, both in name and reality, were in uſe among their Anceſtors 15 Ages before *Cæſar*, in honour of *Atinus* (the Sun) *Frigga* (the Moon) and *Freia*, or *Ceres* (the Earth.)

For a Concluſion, he ſays, that ſome time after *Adonis* had brought the Daughter of *Ceres*, and with her the exerciſe of Agriculture, from *Sicily* into their Country; both the Daughter, and the Mother ſeeking the Daughter, and under their Names the Earth, undergoing one while Summer, another while Winter, began to be had in very great Honour. That neither in the Writings of the Ancient *Greek* or *Latin* Poets, nor of their *Scalds*, by the name of *Inferi*, is to be underſtood any Cœleſtial or Subterraneous Place, much leſs Hell itſelf, which ſome late Writers have plac'd in the *Æther*, others, with a like folly, in the Center of the Earth: For who can ſay, that either for entring ſuch places there was need of a Southern Wind, or for leaving them of a North? Who could expect in them the exerciſe of Agriculture? Who will ſay, it matters whether perſons there feed on Acorns, or Bread Corn? *&c.* That rather, in a manner all the marks of the *Inferi*, given by the Ancients, moſt exactly agree to Northern *Sweden*, *viz.* 1 An Abyſs, or *Chaos*, that is, a barren and deſart place, ſuch as *Saxo* has deſcrib'd under the Pole. 2. A ſharp and Snowy Winter, much ſpoken of by *Ovid*. 3. A dark Pole, known to *Claudian*; and many other ſigns he ſets down; and quotes *Plutarch*, ſaying that *Homer* had the ſubject of his Fable concerning the *Inferi* from their Country, and that their *Barbarians* paſt thence into *Italy*, and were firſt call'd *Cimmerij*, and ſince, not improperly, *Cimbri*. But he ſays he ſhall ſay more of this affair, where he ſhall treat again of the *Inferi*, in another Volume; where he will alſo ſhew, that beſides the *Inferi* and *Elyſij* that Inhabit the Polar Earth, other ſubterranean *Inferi* and *Elyſij* under the ſame Pole have been excogitated by their Anceſtors to repreſent the pains of all the Wicked, and the Joys of the Good after Death.

The eighth Chapter treats of *Selenolatria*, or *Moon-worſhip* of the North: Here he tells us from *Olaus Magnus*, that their Anceſtors worſhipp'd the Moon as well as the Sun, becauſe in Winter, in the Sun's abſence, they continually us'd the light of the Moon, which failing at the New, they order'd all their actions, even in the day time, by the light of their bright Stars increas'd by the whiteneſs of the Snow: But he ſays, becauſe the Worſhip of the Sun and Earth could not be well expounded before by him, but withal, he was forc'd to ſpeak of the Moon, and draw from the Fables of the Antients, thoſe things that belong'd to its Worſhip, therefore he here only tells us the brief heads of what he had written before.

The Ninth Chapter treats concerning the *Runick-Faſts*. He tells us, the Inventor of theſe *Faſts* was *Atlas*, King of the North. The cauſe of ſo noble an invention, was a better and more ready way of finding out the annual Rotations of the Sun, and Menſtrual of the Moon, as alſo among the full Moons, that chiefly which ought next to follow the Sun yearly returning. Now, from their *Cimmerians*, by whom ſuch things were obſerv'd, the Sun was wont to be wanting 40 days, and the full Moon next inſuing the Suns return, was called the *Jule* full Moon; and ſo diligent and accurate an account of this full Moon, above all others, was then taken, becauſe at that time, at the publick Rejoycings for the Reſtoration of Light to the Northern World, not only all the little Kings and Governours within their Kingdom, but alſo Foreign Kings and Tributaries, or ſuch as were any way obnoxious to the Kings of the North, were bound to be preſent.

The *Runick Faſts*, he ſays, began the year from that day in which the Sun, after 40 days abſence in *Eridanus*, firſt ſhin'd to thoſe that Inhabited the *Low Lands*, among the *Cimmerians*: And that the Kings of the *Cimmerians* leaving the Notherly parts, brought theſe *Faſts* with them to the Southerly parts of *Sweden*, even to *Upſal*, as the moſt ready Inſtrument for calculating the Year. And he here explains at large the uſe of the *Runick Faſts*; and obſerves that tho the Sun lies hid under the *Horizon* of the Northern Inhabitants for many days in the Winter, yet it diſplays its Rays of Light about noon, like a dawning or break of day, or as a Beard.

As to the Age of the *Runick Faſts*, he ſays it may be ultimately referr'd to about the year of the World 1800, and that thoſe *Faſts* receiv'd their laſt perfection about the year of the World 2200. This Science he ſays increas'd by long and diligent Obſervations of the Sun and Moon paſſing round the Earth: for it was not a labour of a few days, but of years and ages, by which the names of *Atinus*, *Atlas*, *Saturn* and many more Nothern Men, roſe to an Immortal Glory, as under whoſe hands a Science ſo excellent and neceſſary grew up; and theſe Labours had place 500 or 600 years before the *Trojan War*, as *Diodorus*, who in his firſt ſix Books treats profeſſedly of Affairs more ancient than the *Trojan War*, ſeems to have own'd 1700 years ſince.

He aſſures himſelf, he has here ſet forth, for the greateſt part, whatſoever can make for the explanation of the *Runick Faſts*; and dares aver that no Nation in the World has penetrated to that accurate Theory of the Sun and Moon before their Anceſtors, but rather that the

Ægyptians, *Greeks* and *Romans* have borrowed many things from them, and at length, caſting off their Antient Cuſtom, whereby they made the Vernal or Autumnal *Æquinox*, or the Summer Solſtice, the Sun always high raiſed above the Horizon, the beginning of their Year, they betook themſelves to the uſage of his Anceſtors, who joyn'd the beginning of their Year, with the firſt return of the Sun, after having been for ſome time abſent. And here he explains at large a Cut he has given, in a precedent Chapter, of a *Runick Almanack*.

The tenth Chapter treats of the *Tympana Laponica*, or *Lapland Drums*; which he ſays are generally divided into three Regions, the higheſt Region contains the Heavens and all Cæleſtial things, and all Volatils; the middle Region contains the Earth, with Men and all Animals; the loweſt Region contains Infernal and Subterraneous places and then proceeds to give a particular and genuine Explication of all the Figures or Marks that are on the ſaid *Tympana*. And in the concluſion he owns that the greateſt part of theſe Figures and Animals are drawn to other affairs by the *Laplanders*, who beat their Drums with great Impiety and Superſtition: For if they would know whether, when they go on Hunting, they ſhall have ſucceſs, they beat their Drum with *Thor's Hammer*, and diligently obſerve a certain Ring leaping on the Drum, which if they ſee reſt on the Image of a *Ranger*, they no way doubt but they ſhall kill a wild *Ranger* that day: If it reſts on a Wolf, they conclude they ſhall have a Wolf for their prey. But the Author ſays he paſſes by theſe things as being beſide his purpoſe, and refers thoſe who are delighted with them to *Shefferus's Lapponia*, to *Olaus Magnus*, and others. However, I ſhall give you here what ſeems to be the Authors ſenſe concerning what may now be expected from the Superſtitious uſe of the *Lapland Drums*, inſerted by him in the fifth Chapter of this Book, p. 283. It is as follows. Since the Doctrine of *Christ* came to *Lapland*, Men could not but forget many things relating to Superſtition, an execrate and caſt off other things, or at leaſt be at an uncertainty in many things, mixing Superſtition with the Truth, nothing being more certain than that Paganiſm is not yet quite extinct in thoſe places. Whether therefore the *Laplanders* themſelves are now ignorant of the make of the moſt antient *Drums*, or whether ſo differing a fitting of the *Drums* deprives them of the knowledge of a thing ſo extreamly vain, they now ſuffer themſelves with extream difficulty to be drawn to make known their Superſtition to others: Perhaps alſo ſhame or fear in a manner deters ſome. To paſs by that the chief *Arcanum* of Superſtition will not be revealed, be it as it will, you ſhall now hardly find any Man, who knows rightly how to manage this Drum, or to explain it to others. And thoſe who think they know ſomewhat of this kind, either ſo obſtinately conceal it,or ſo diſſemble their skill,that thoſe labour in a manner in vain, who with any Gifts how great ſoever, or high Drinking, (which is wont to go a great way with them otherwiſe) endeavour to break or conquer that ſilence ; but among Gifts (if any Man will purchaſe this Art of them) the *Laplanders* are moſt earneſt Lovers of Imperial *Rix Dollars*.

The laſt Chapter treats concerning the *Menſa Iſiaca*, or the *Table* of *Iſis* : And here the Author ſays, the World owes great thanks to *Pignorius*, for having preſerv'd ſo great a piece of Antiquity from oblivion, and for having illuſtrated it with the Commentaries and Conjectures of other Men as well as his own : But whereas his account of it is very imperfect,the Author ſays, he undertakes the explication of this Monument, which he had never dar'd to attempt, had not the ſituation of his Country, the cuſtom of the Inhabitants, the motion and operations of the Sun and Moon about their Earth, the *Runick Faſts*, the *Lapland Drums*, the Fables and Traditions of the Northern Inhabitants, given ſome light to the undertaking: for as the *Ægyptians* receiv'd all their Worſhip of the Sun, Moon and Earth from *Iſis*, or *Io*, the Daughter of *Inackus*, who was a Northern Goddeſs, ſo alſo their Table of *Iſis* has its figures ſo diſpos'd, that they repreſent exactly enough the motions and Monthly changes of the Sun and Moon throughout the whole year, as the North requires or admits: He therefore has given us the ſame Cut with *Pignorius* of the Table of *Iſis*, divided into 12 Months. And this is the order of that *Table*, that to each month three figures belong, and beſides all theſe there is one figure in the midſt of the reſt, ſitting on a Throne. Now it came in the Authors mind, that by the three Images belonging to each month, the Sun, Moon and Earth ought to be underſtood: And the whole Table is divided into three parts, for the Winter, Summer and Autumn, which their Anceſtors receiv'd; and as each of theſe parts of the year contains twelve figures, three always anſwer to one month, that is, ten days will belong to each figure, and thirty days to each month; and this is according to the manner and cuſtom of the North. And therefore to the greater parts of the year, or to each Seaſon 120 days are to be allowed, which being thrice counted for ſo many parts of the year, they will produce in all 360; the Image therefore remaining and ſitting on its Throne, ſtands for the *dies intercalares*, which being added, there will ariſe the Annual ſpace of 365 days and the vantage; and he proceeds to give us a ſuccinct explication of all the Images or Figures in particulars; and tell us, the Figure of *Oſiris* holds in one hand a Croſs with a Ring to it; and *Pignorius* owns, that the Croſs was known and us'd by the *Ægyptians* and other Profane Nations, before the times of *Chriſt*: And quotes *Suidas*, ſaying, that while *Theodoſius the Great* was Emperor, when the Temples of the *Gentiles* were demoliſh'd, in the Temple of *Serapis* were found Hieroglyphical Letters, having the form of a Croſs, being ſeen by the *Greek* Chriſtians, they ſaid that the Croſs among the ſkilful in Hieroghyphical Characters ſignified a Life to come. This kind of Croſs, he ſays, is drawn on the *Lapland Drums*; but as often as we ſee this Croſs there given to *Thor*, it wants the Ring, and *Thor's Hammer* is ſignified by it: And now the *Laplanders* ſever that Ringed Croſs into two parts, making the Croſs or Hammer of Tinn, and the Ring of Braſs, Iron, *Orichalcum* or of Silver, and beat the *Drum* with the Hammer; and from the various motions of the Ring leaping on the *Drum*, they make conjectures of the events of Diſeaſes, the fates of Men, the happy or unhappy ſtate of dying Perſons after death, of the ſtate and conditions of things far diſtant, and of all other hidden and abſtruſe matters: And he concludes this ſecond part of his *Atlantica*, in which he took upon him chiefly to conſider theſe three Bodies of the Univerſe, the Sun, Moon and Earth, after the manner of the Antients, with the words of the learned *Hoperus*, in his *Themis Hyperborea*, and alſo with thoſe of the Learn- *Guliel. Stiehlius*; the former ſaying, that whatſoever there was of Philoſophy among the *Europeans*, *Aſiaticks* and *Ægyptians*, flow'd from the Antient *Hyperboreans*; the latter, that the Names and likewiſe the Worſhip of the Gods and Goddeſſes came from the North to the *Greeks*, and thence to the *Romans*.

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to the Royal Society, at the *Princes Arms* in *St Paul's*-
Church-yard, 1705.

BRITISH MUSEUM NATURAL HISTORY

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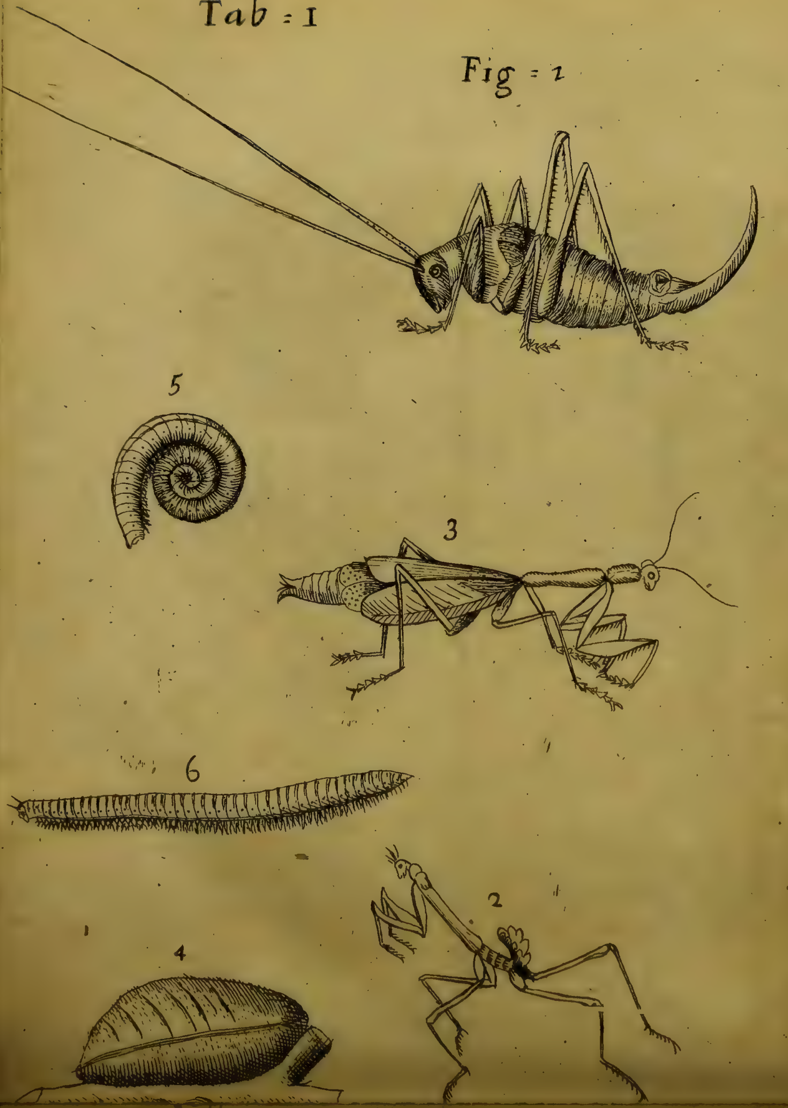

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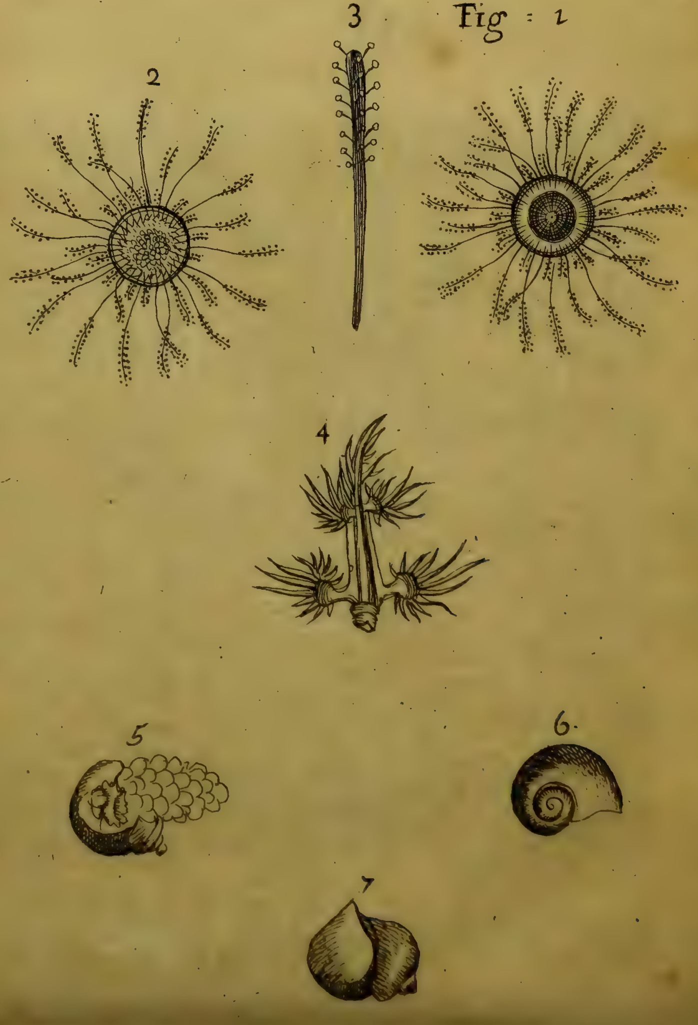

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PHILOSOPHICAL TRANSACTIONS.

For the Month of July, 1705.

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I. Catalogus Concharum foſſilium, Metallorum, Mineralium, &c. quæ a Cl. D. *Johanne Jacobo Scheuchzero,* M. D. *Tiguri,* & Societat. Reg. *Angl.* Soc. nuper accepit D. *Jacobus Petiver,* S. R. S.

II. *Epiſtola* D. Joannis Philippi Breynii, *M. D. & Societat. Reg. Soc. De Plantis & Inſectis quibuſdam rarioribus in* Hiſpania *obſervatis.*

III. *Part of a Letter from Mr* N. Regnart, *concerning a Pin found in the Gizard of a Fowl.*

IV. Olavi Rudbeckij Atlanticæ, *ſeu* Manheimij *Pars Tertia. In qua vetuſtiſſima majorum noſtrorum Atlantidum lapidibus, fago, æri, ſive cortici Runas ſuas incidendi ratio, una cum tempore, quo illa primo cæperit, exponitur. Necnon Aurei numeri ſingulis annis tributi, & Signorum Cæleſtium, quæ abhinc ad Græcos & Latinos ſunt tranſlata, vera origo & ſignificatio traditur. Et illæ a diluvio Noachi primæ ætates, atque in illis prima* Atlantidum *noſtrorum forma deſcribuntur : quæ migrationes & bella ſub* Boreo, *ſeu* Saturno, *ejuſq; filio* Thoro *ſeu* Jove *geſta ſunt, recenſentur : & denique* Scytharum

Phœnicum & Amazonum *his ducibus in* Indo-Scythiam & Phœniciam *ſeu* Palæſtinam *e* Sueonia *factæ expeditiones enarrantur. Quibus omnibus mythologiæ perplures, quarum ſenſus in hunc uſque diem incognitus, hic demum detectus prodit, jucundæ ſane & perquam utiles adjunguntur.* Upſalæ *in fol.* 1698.

I. Catalogus Concharum foſſilium, Metallorum, Mineralium, &c. quæ a Cl. D. *Johanne Jacobo Scheuchzero*, M. D. *Tiguri*, & Societat. Reg. *Angl.* Soc. nuper accepit D. *Jacobus Petiver*, S. R. S.

1. A*mmonis cornua* varij generis armata ex *Burgundia.*

2. *Ammonis cornua* coſtis e medio alternis. *Figuratum novum* ex altiſſimo *Glaronenſium* Monte *Guypne.*

3. *Anomius Conchites*, roſtro prominulo & veluti pertuſo donatus *Liſter.* Hiſtor. *Animal. Angl.* p. 240. Fig. 46. Montis *Legeri.*

4. *Anomius Conchites* rugoſus, roſtro ſubtereti & inſigniter adunco donatus *Liſt.* Hiſt. *Anim.* Angl. p. 238. Fig. 45. *Ex Agris prope* Schentznach *Territorij* Bernenſis.

5. *Biſmuti* ſive *Plumbi cinerei* vena. *Snebergico Miſnica.*

6. *Bolus rubra*, ex Monte *Aubrig* Suitenſium.

7. *Bucciniola* s. *Teſtacea foſſilia* curioſiſſima ex *Agro Bononienſi.*

8. *Chelidonius* Mineralis, ex Monte *Doronaz*, Ditionis *Bernenſis.*

9. Cortex *foſſilis* prope pagum *Waltikon*, Ditionis *Tigurinæ.*

10. Cryſtallus *Helvetica* diaphana.

11. *Cryſtallus* hexagona Micâ viridi adſperſa.

12. *Dendritæ* & *Stigmitæ* ex Comitatus *Badenſis* Ferri fodinis.

13. Fluores *Saccharum candidum* referentes, ex Lapicidina *Uningenſi*, Dioceſeos *Conſtentientii.*

14. *Ferri* vena globoſa *ex Comitatu* Badenſi.

15. *Ferri* vena *Lengnavienſis* ex Ditione *Bernenſi.*

16. *Lentes* lapideæ ſtriatæ, utrinque convexæ, vitreis figura ſimiles, in maſſa lapidea, vario ſub ſchemate conſpicuæ *Lithograph. Helvet. Specim.* p. 30. Fig.

17. *Lentes* utrinque convexæ, e maſſa lapidea exeuntes. ad *Lithogr. Helv. Spec.* p. 30.

18. *Lithanthracis* ſpecies, *Vitrioli* parens, ex medijs ſaxis propè *Lithopolin.*

19. *Lithanthracum* genus, *Vitrioli* parens, ex medijs ſaxis Lapicidinæ *Henlibergenſis* ditionis *Tigurinæ*. Steingalle *noſtratibus*. q. d. *Fel Saxi.*

20. *Marga* terrea *Wagner.* Helvet. *Curioſ.* p. 342. Ex Monte *Vocetio.*

21. *Marga* griſei coloris, in ſaxo arenario prope *Lithopolin.*

22. *Minium* nativum *Hungaricum.*

23. *Pecten* in *Chryſocolla* lapidea è ſummis *Alpium Suitenſium* jugis.

24. *Plumbi* vena dives s. *Galena.* Bleigl. w 2.

25. *Pyrita* æreus globoſus, ex altiſſimo monte *Aubrig* Suitenſium.

26. *Pyrites* aurei coloris ſaxis adhærens, ex *Alpibus* Suitenſium.

27. *Pyrites* dodecaedros *Fordaz* prope *Aquilegiam* Territor. *Bernenſis.*

28. *Salis Foſſilis* vena, prope *Aquilegiam* (Aigle) *Territ. Bernenſis.*

29. *Spatum* Montis Legerii. *Wagner.* Helvet. *Cur.* p. 327.

30. *Sulphur vivum* ſeu *Virgineum* Wagn. *Helvet.* Cur. p. 334. ex Terr. *Bernenſi.*

31. *Talcum* candidum, prope pagum *Sehen* Ditionis *Tigurinæ.*

32. *Talcum* fuſco aureo colore ſplendens.

33. *Talcum* Eburneum. *Arabicus* lapis Ebori ſimilis, ex monte *Legerio.*

34. Talciforme *Saxum* cinerei coloris, prope *Tigurum.*

35. *Tofus* laminaris *Roſtacenſis* Agri *Tigurini.*

36. *Tofus* varijs Arborum folijs pregnans. Ex pago *Stallikon* ditionis *Tigurinæ.*

37. Tofus *Fagi* folijs prægnans. Ex pago *Stallikon* ditionis *Tigurinæ.*

38. Tutia *exalbida* Tigurina. *Tofus* ex Balneo *Vulturino*, ditionis *Tigurinæ.*

39. *Vitriolum* ex Vena, quæ ad lacum *Tigurinum* effoditur.

40. *Vitrioli* vena ex *Alpibus* Suitenſium.

II. *Epiſtola* D. Joannis Philippi Breynii, *M. D. & Societat. Reg. Soc. De Plantis & Inſectis quibuſdam rarioribus in* Hiſpania *obſervatis.*

Viro Celeberrimo,
Domino Hans Sloane, Med. Doct. &
Illuſtriſſ. Societati Reg. Angl. à Secretis &c.
Joannes Philippus Breynius, J. F.
S. D.

NUllæ quamvis ad meas Româ, ut Tuis & Illuſt. Soc. Regiæ mandatis morem gererem, ad Te datas, quibus præter nova quædam literaria, artem imprimis noſtram ſpectantia, Alcyonii cujuſdam elegantiſſimi iconem & deſcriptionem, unà cum meâ de Alcyonii ſemine conjecturâ addideram: nullæ, inquam, quamvis mihi redditæ ſint reſponſoriæ, ex quo minùs fortè eas ad palatum fuiſſe tuum poſſem colligere; præſentes tamen iis ſuperaddere ſum auſus, ut ſi invitatorias a te ad ſcribendum obtinere non valeam, prohibitorias ſaltem, quæ calamo meo nimiâ prurigine forſitan tibi, Vir Celeberrime, gravioribus negotiis obruto, moleſtâ laboranti, altum imponunt ſilentium, extorqueam. Ut autem abque ulterioribus verborum ambagibus ad rem ipſam accedam, paucis dicam, me valedixiſſe Romæ elapſo menſe Januario, tranſiiſſe Loretum, Anconam, Bononiam, Ferrariam &c. tandemq; non leviter rigidiori tunc temporis, quam mihi imaginatus fueram, brumâ tentatum attigiſſe Venetias. Ut ut autem nihil de ſplendidiſſimâ hâc Urbe literis hiſce inſerere conſtituerim, perilluſtre tamen Excellentiſſimi D. Chriſtini Martinelli, Nobi-

lis

lis Veneti & ſummi, ut cæterarum bonarum artium & ſcientiarum, ita & Rei herbariæ Patroni Nomen, ob fervidiſſimum, quo Botanicem proſequitur, amorem, & plurima mihi etiam non merenti præſtita officia, intactum relinquere, piaculum duxi. Poſt quinque hebdomadarum dimoram Venetiis Patavium me contuli, ad celeberrimam in arte Machaoniâ præſertim Academiam, quam etiamnum, licet Studentium numerus, illo, qui fuit quondam, longè ſit inferior, Clariſſimis in hâc arte Profeſſoribus (quibus ex meliori luto finxit præcordia Titan, quique excuſſo miſerrimo auctoritatis jugo, verè rationalem, mechanicam puto Philoſophiam & Medicinam liberè profitentur) ceu tot luminibus coruſcantem deprehendi. Sufficiet nominaſſe Gulielminum, Mathematicum & Theoreticum inſignem; Ramazzinum maximæ eruditionis Virum; Valliſnerium, uti in omni Medicinæ parte verſatiſſimum, ita in Inſectorum indagine, eorumq; (ſecus ac plurimi hoc ævo faciunt, Inſecta collegiſſe, obiter deſcripſiſſe & depinxiſſe ſatis eſſe rati) generationis & Metamorphoſeωn hoc ſeculo non agnoſcente parem, quod præter ipſius ſcripta Italico Idiomate edita, Opera teſtabuntur brevi edenda & Illuſtriſſ. Societati Reg. conſacranda; quibus futilem eſſe ſpontaneam Inſectorum generationem ex putredine, contra nonnullos etiam Neotericos, qui haud parum in hâc arenâ deſudâſſe exiſtimantur, non vanis ſpeculationibus, ſed ſolidiſſimis Præceptoris ſui M. Malpighij immortalis memoriæ Viri veſtigiis feliciſſimè inſiſtens, demonſtrabit experimentis & obſervationibus. Sufficiet, inquam, nominâſſe D. Abatem Felicem Viali primi ſubſellij Botanicum, Viſcardum Anatomicum, Marchettum Chirurgum, deniq; D. Abatem Fardellam verè Philoſophum, ut alios ſileam. Horum omni laude majorum Virorum humaniſſimâ doctiſſimâque conſuetudine (ad quam Hortus accedebat publicus, nec non ille Excellentiſſimi D. Joannis Franciſci Mauroceni, Nobilis Veneti & h. t. Oratoris ſereniſſimæ Reipubl. apud ſummum Pontificem &c. Mæcenatum Rei Botanicæ Principis, qui uti me præſentem Romæ, ita jam abſcentem Patavij variis cumulavit honoribus & obſequiis; rarioribus plantis Alpinis præſertim & Siculis ſuperbientes) adeo mox fui captus, ut in animum moras hic, & quidem longiores nectere induxerim, me totum & unicè ſtudiis, à quibus varia itinera & alia hinc inde obſervanda me diverterant, redditurus; nec defuit propoſito ſucceſſus. In hoc autem ſuaviſſimo otio, in quo tamen ut verum Tibi abſq; jactantiâ fatear, nil fui minùs, quàm otioſus, cum Ephemerides meas Hodæporicas qualeſcunq; evolverem, incidi tandem in illum candido mihi ſemper notandum lapillo diem, quo me Hiſpanorum terram, fugitivo quamvis pede preſſiſſe per vitam gloriabor. Subiit mox animum meum cogitatio, me forte non, quod dici ſolet, oleum & operam perditurum, nec opellam tibi ingratam præſtiturum, ſi illius diei tibi & Illuſtriſſ. Societati Reg. brevem quandam exhiberem Σκιαγραφίαν, quam accipe ſequentem.

Anni elapſi d. 31. Auguſti Styl. Angl. potentiſſima Claſſis bellica Anglo-Belgica ventis adverſis & tranquillitatibus nimium retardata, jactis in ſinu maris, qui eſt prope parvulum oppidum Alteam in regno Valentiæ, anchoris, ut dulcium aquarum penuriæ, quâ laborare incipiebat, novarum collectione mederetur, certus mox militum nautarumq; numerus Præfectorum juſſu, in littus, ad fluvii non quidem magni, ſed limpidiſſimâ & ſaluberrimâ lymphâ ex proximis montibus devolutâ veloci curſu in mare ſeſe exonerantis deſcendit oſtia. Ego terram hanc, quam eminus videbam, cominus quoq; accuratius incredibili luſtrandi flagrans deſiderio, die ſubſequente ante ipſum ſolis ortum & ipſe viſitavi littus, per integrum diem hinc inde, quantum limites à militibns præfixi permittebant, ſedulus oberrans. Regio erat alpeſtris, ſaxoſis elatiorum montium jugis in ipſum cœlum ſeſe quaſi abſcondentibus; mare inter tamen & prædictum flumen oppidumq; planities videbatur ſatis ſpatioſa, arenoſa partim, partim argillacea, quæ poſtmodum in jamjam deſcriptos montes ſeſe extollebat, quæq; frumento Saracenico ex parte conſita, maximam partem verò inculta, mihi certè ob rariſſimarum plantarum numerum longè à Naturâ cultior, & quovis horto gratior campus. Omnia cœleſti adhuc madebant rore, qui in hiſce Regionibus, uti noſti, eſſe ſolet longè liberalior, pluviarum, utpote rariorùm hîc æſtivo tempore defectum aliquomodo ſupplens; uti hoc tempore quoq; eum ad digiti latitudinem ſolum penetraſſe obſervabam. Sed roridam hanc lympham brevi diſſipabat æſtuans Syrius,hoc die ferme intolerabilis; ita ut ſolum paulo ante dictâ lymphâ tam benignâ à Matre Naturâ perfuſum, mox quaſi ſqualidum & exuſtum ſpectantium ſeſe offerret oculis. Littus ipſum arenoſum erat, innumeris ſilicibus variæ magnitudinis conſperſum, ſed quod mirabar præter nodoſas vilium algarum radices & paucas aliquot pilas marinas habebat nihil, ita ut ne unicum quidem fucum aliamve plantulam marinam, aut vix ullam concham me vidiſſe meminerim. Nullos quoque,etiamſi quæſiverim, reperi lapides aliqua figura inſignes. Saxum verò ex quo Montes maxima ex parte componebantur coloris erat gryſei, nec uti hariolabar inſignis duritiei.

Vegetabile regnum largiorem mihi præbebat meſſem, utpote quod,tam delectabili &tam rara oculos paſcebat, nares & manus varietate; ut oculus in nullam plagam converti poſſet, in qua non rariorem mox deprehenderet herbulam; nares nullibi ab exhalationibus aromaticarum & odoriferarum varii generis plantarum per atmoſphæram diſperſis non ferirentur; manus verò licet nunquam feriarent, operi tamen impares eſſent. Sed ne dum multa dico, nihil dixiſſe videar, occupato in generalioribus calamo, en paucarum quarundam, ex multis à me obſervatis, ſtirpium tumultuario ordine congeſtum catalogum:

Nerion fl. rubeſcentibus, C. B. P. Oleander, Laurus roſea, Lob. Hujus quam plurimæ arbuſculæ tres pedes vix excedentes floribus ſiliquisque onuſtæ ſupradeſcriptam planitiem decorabant.

Siliqua dulcis, C. B. P. cum fructibus maturis.

Lentiſcus vulgaris, C. B, P. copioſè cum fructibus in littore; rarò 4 pedes ſuperabat.

Pinus maritima minor, C. B. P.

Rhamnus Hiſp. ſaxatilis, capillaceo folio, Inſt. R. H. copioſè baccis nigris gravidus inter ſaxa. Folia quidem non erant verè capillacea, ſed tamen admodum anguſta & longa.

Thymelæa fol. Lini, C. B. P. copioſè.

Thymelæa tomentoſa foliis Sedi minoris, C. B. P. Sanamunda tertia Cluſ. cum floſculis admodum frequens.

An præcedentis varietas foliis inferioribus Myrti incanis? An verò Thymelæa Hiſp. foliis Myrti incanis, Inſt. R. H?

Erica foliis Corios, multiflora, J. B.

Malus punica ſativa, C. B. P.

Myrtus anguſti folia, Bœtica, C. B. P.

Palma, C. B. P. hujus unica arbor altiſſima plantata videbatur.

Palma humilis, ſpinoſa, J. B. Inter ſaxa frequentiſſima, fructibus fœta maturis aurancei coloris. Hæc pumila erat admodum, utpote truncum vix emittens, nec folia ultra pedem & dimidium erigebantur; eam differre exiſtimo à Chamæryphi, cujus excelſas arbores in Belgij & Italiæ hortis me obſervâſſe memini. Sapor fructuum dulcis eſt cum inſigni adſtrictione.

Convolvulus argenteus elegantiſſimus, foliis eleganter inſciſis, Inſt. R. H.

Tithymalus Hiſpanicus, folio longiore cordiformi, Inſt. R. H.

Centaurium minus Hiſpanicum, floribus minoribus.

Centaurium minus, ſpicatum, flore rubro, Hort. R. Par.

Coronopus Siculus, fruticoſus, platyphyllos, Boccon.

Marrubium Hiſp. ſupinum, foliis ſericeis argenteis, Inſt. R. H.

Roſmarinus Hortenſis, anguſtiore folio, C. B. P. naſcitur copioſiſſimè in planitie.

Thymum incanum minus. An Thymum ſupinum, candicans, odoratum, Raij Syn. Stirp. ext. Brit.

Lavendula Hiſp. latifolia tomentoſa, Inſt. R. H.

Origanum Onites, C. B. P. Origanum Creticum, I B.

Helianthemum Thymi folio, glabrum, Inſt. R. H. Ciſtus fol. Thymi, C. B. P.

Salicaria Hyſſopi folio anguſtiore, Inſt. R. H. Hyſſopi-folia minor anguſtioribus foliis, C. B. Pin.

Helianthemum foliis Roriſmarini ſplendentibus, ſubtus incanis, Inſt. R. H. Ciſtus Ledon fol. Roriſmarini ſubtus incanis, C. B. Pin.

Hypericum tomentoſum, ſupinum, minus, s. Monſpeliacum, C. B. P.

Ciſtus mas, folio rotundo, hirſutiſſimo, C. B. P.

Ciſtus Ledon, foliis Roriſmarini hiſpidis, C. B. P.

Vulneraria Hiſpanica fruteſcens Ciſti Halimi folio incano, nunc ſimplici, nunc terno, flore luteo, ſpicato. Hanc novam mecum judicavit Cl. I. B. Triumfetti.

Doryonium Monſpelienſium, Lobel.

Anonis non ſpinoſa, flore luteo, variegato, C. B. P.

Jacobæa Hiſpanica, Roriſmarini foliis, Inſt. R. H.

Polygonum maritimum, Hiſpanicum, caulibus longiſſimis, Inſt. R. H. Flagella ſæpius tres vel quatuor pedes adæquant, foliis ubi florent ut plurimum vidua.

Adiantum foliis Coriandri, C. B. P. frequentiſſimum ad rivulorum margines.

Sed hæc, ne ſiccâ Graminum ſpecioſiorum licet, Cyperorum, Juncorum aliarumq; Plantarum enarratione tibi ſtomachum moveam, ſufficiant. Itaque cum delectat varietas ad Animalia tranſeo ; ex quibus non Leones feroces, nec turrigeros tibi referam Elephantes, hos enim a me jam non expectas; ſed vilia & abjecta aliquot delineabo Inſecta, mole ut ſit longè, non tamen artificio, jam jam enumeratis minora. Quod equidem non fugit tot ex veſtratibus Clariſſimos Viros, qui in eorum Hiſtoria componenda, tam anxie deſudarunt & adhuc deſudant. Ex immenſo igitur Locuſtarum ſc. Papilionum, Phalænarum, Libellarum, Cochlearum, &c. a me in Hiſpania obſervatarum numero, pauca ſaltem annexorum Schematum ordinem ſecuturus delibabo.

Tabulæ primæ igitur Fig. 1. Locuſtam exhibet, quæ an deſcripta ſit, nec ne ignoro, certe mihi videbatur rariſſima. Coloris erat viridis elegantiſſimi, figuræ verò & magnituditudinis, quæ in figura exprimuntur. Tardè ſeſe movebat alis deſtituta, quarum locum in tergo, immediate ſub clypeo duæ parvulæ, rotundiuſculæ, luteſcentes occupabant membranulæ. Caput antennis ornabatur longiſſimis, & articulatis viridibusque pariter. Unicam ſaltem videbam Oleandro inſidentem.

Figurâ 2. adumbratur Inſectum, quod ab Aldrovandro in Hiſt. Inſect. L.4. T.5. f. 2. & 3. nomine Bruchi inſolentis figuræ depingitur deſcribiturque; ſed deſcriptio ejus manca eſt & Icon minime accurata. Caput huic meo Inſecto erat oblongum, ſuperne criſtatum, & duabus breviſſimis antennis anterius donatum. Corpus & Crura tenuiſſima, cauda vero latiuſcula, articulata, circumflexa ac in ambitu crenata, ſimili eminentia per medium excurrente. Quieſcens Corpus cum binis anterioribus cruribus complicatis erectum tenebat, progreſſum vero ijs quoque ad ambulandum utebatur, quæ nihilominus pro arripiendo victu forcipum inſtar primariò mihi videbantur fabrefacta. Color totius ex cinereo erat luteolus, maculis fuſco-nigricantibus interſperſis. Unicum duntaxat reperi inter gramina, quod poſtmodum per decem dies abſq; ullo alimento ſervavi ſuperſtes, donec tandem fatali vitæ ejus filum abrumperem acu. Ad hoc genus quoq; referendum quod Aldrovandus dict. libr. T. 3 f. 9 exprimit.

Figura 3. Inſectum exhibet, quod Mouffettus & Jonſtonus nomine Mantes deſcribunt & delineant. Ad quod genus meo judicio pertinent ex Aldrovando l. c. T. 1. f. 1. & 2. & T. 3. f. 10. ex Jonſtono T. 13. f. 18. 21. 22. & præterea omnia Folia ambulantia dicta ex Indiis delata, quæ minime Vegetabilium folia in ejuſmodi Animalcula transformata, uti ſomniarunt nonnulli, ſed Inſecta Inſectorum modo producta eſſe, omnibus facilè rem accuratius examinantibus, nec tam faciles aures prodigioſis [illegible] [illegible]tioribus præbentibus patebit, opinor.

ſectum eandem exacte figuram habebat & magnitudinem, quæ in fig. 3. videntur. Quatuor inſtructum erat alis, quarum duæ ſuperiores venoſæ aridorum foliorum texturam habebant & ſimilitudinem (hæc magis conſpicua in Indicis ſpeciebus, unde fabulæ origo) coloris ex flavo fuſci; inferiores vero dictis majores quidem, ſed ſubtiliores, nec ita venoſæ, flavicantes, nigris maculis aſperſæ: Ita ut ſuperiores quodammodo thecarum vices gerere viderentur, ut in Scarabæorum genere obſervamus. Præterea notanda extremitas ventris bifurca, anteriora crura craſſiora, ſerrata, uti in Inſecto antecedente, quæ etiam ad eundem uſum a naturâ inſtituta. Corpus reliquum colore erat ex fuſco luteum.

Cum binorum ultimorum Inſectorum figuras Clariſſ. Valliſnerio ſupra laudato forte fortuna oſtenderem, ipſi, pro ſummâ, quâ me proſequitur humanitate & benevolentia mox ex annotationum ſuarum Theſauro ſequentia de iiſdem mecum communicare placuit. Scilicet ab ipſo etiam eſſe reperta in Italia in Scandianis nempe, Regii & Coneglanis Collibus, ſibi quoq; miſſa ab amicis ex Marca Anconitanâ, Maurata, Liburno & Florentia; ſe tandem eadem foviſſe in ſuo horto. Eſſe ejuſdem generis Inſecta, ſexu ſaltem diverſa, marem videlicet illud, quod alis caret Fig. 2. a me depictum, fæminam vero alatam fig. 3. adumbratam. Ab Hiſpanis dici *Saltamonte*, a Liburnenſibus *Cavallo verde*, ab amico ſuo D. Ceſtono *Grillo-Centaurum*, a ſe verò *Araneo-Locuſtam*. Se eadem aliquando obſervaſſe meis figuris dimidio majora, fæminam ſæpius coloris vireſcentis, unde *Cavallo verde* Italis dicitur. Eſſe porro carnivorum & jucundo ſane ſpactaculo prædam ſuam, ut Muſcas, Gryllos, Locuſtas minores, imo nec proprio ſuo generi parcendo, cruribus anteriobus venari, capere, breviq; erectum, ut plurimum devorare; non leve ferociæ & Tyrannidis argumentum. Præterea fæminam unius noctis s. 8. horarum ſpatio celluloſum ſuum extruere nidum, podice elevata totum opus perficiente, & reliquo corpore immoto. Antequam verò generationi aptæ ſint, fæmellas biennium attigiſſe opus eſſe obſervavit, tumq; primum ſuum elaborare nidum nucis avellanæ magnitudine, quæ anno ſubſequente nucem ſuperat & tertio tandem binas adæquat. Nidificationis tempus eſſe Autumnum, Menſe Majo verò vel Junio anni proximè ſequentis inde prodire prolem communis cum parentibus figuræ, ſed exiliſſimam, quæ centenarium numerum plerumque, ſubinde verò duplicatum, pro magnitudine nidi & matris ætate provectiori, attingit.

Nidi ipſius figuram ante oculos ponit fig. 4. quam ex eo, quo me jam nominatus Vir donavit, deſumſi. Coloris eſt ex luteo cinerei, videturque compoſitum ex humore lenteſcente ex podice emiſſo & indurato. Ruſticis vulgo *Cicala ſecca* dicitur, qui eundem mortuam aridamq; credunt cicadam.

Fig. 5 & 6. repreſentat Iulum, qui admodum erat frequens in terrâ ſub plantarum foliis. Colore gaudebat albo,nigris annulis atroq; inter annulum & annulum puncto diſtincto. Caput nigrum quemadmodum & pedes.

Et hactenus quidem de Inſectis à me in Hiſpania obſervatis, quibus ob thematis affinitatem, Animalcula tria marina, quæ non procul ab Inſulâ Yvicâ Maris Mediterranei, Menſe Auguſto,à Nautâ quodam Mari tranquillo innatantia reperta ad me deferebantur, ſubjungere liceat. Omnia in Tabula ſecunda delineantur. Et primum quidem ex Urticarum marinarum ab Auctoribus dictarum genere eſt, cujus fig. 1. partem adumbrat ſuperiorem ; ejus limbus non nihil concavus coloris erat cœrulei amœniſſimi, medium verò orbis aliquantulum convexum, ſtriiſq; circularibus ac radialibus ornatum, coloris argentei. Radiorum inſtar eminentes Appendices à ſupina parte ortæ, quas ſatis celeriter remorum inſtar ſurſum & deorſum movebat, erant dilutæ cœruleæ & fermè diaphanæ, quarum extremitatibus minutiſſimi adhærebant ſubtiliſſimis ſuffulti pedunculis globuli ex nigro cœrulei. Hæ autem Appendices leviſſimâ abradibantur Minervâ, ut totum adeò animalculum utpote valde molle & mucoſum deſtrueretur.

Fig. 2. exhibet ejuſdem partem ſupinam, quæ præter Appendices jamjam deſcriptas, filamentis duorum generum exornabatur; primum genus circa marginem poſitum brevibus teretibuſque conſtabat filamentis dilutè cœruleis & glabris; alterum verò centrum occupans, breviſſima quidem habebat, aſt circa extremum orificio quodam hiantia, colore albo. Hiſce animal dubio procul aliis corporibus adhæret capitque alimentum.

Fig. 3. hujus demonſtrat Appendicem Microſcopio viſam. Cæteræ figuræ omnes naturalem habent ſuam magnitudinem.

Secundum quod miri Hirudinis marini ſpecies & quidem lepidiſſima videtur fig. 4. exponit ejus ſcilicet tergum, quod non nihil planum, ſtriâ in medio argenteâ longitudinali elegantiſſimè pictum, lateralibus lineis obſcurè cœruleis; cujus coloris quoque erant pinnæ argenteo intermixto, quas natando celeriter movebat. Latera colore gaudebant dilutè cœruleo, prona vero pars S. venter albo. Capitulum ei erat oblongum duplici barbulâ biniſque oculis inſtructum; os rotundum parvulum, quo variis ſe rebus, ſuctione ut puto, affigere ſolet. In latere ſiniſtro foraminulum conſpiciebatur, quod pro ano habebam. Hujus ſpeciei duo vel tria vidi Animalcula, quæ in vitro aquâ pleno paucas intra horas expirabant; dumque in Vini ſpiritu ſervare tentabam, mox ſummopere contrahebantur, colore cœruleo in luteo-ferrugineum mutato.

Agmen denique claudat Cochlea (fig. 5, 6, 7.) quædam colore, quam figurâ ſpecioſior, rariorque; cœruleo enim tincta erat ſaturo, aliquantulum, quamvis parum admodum ad roſeum quoq; vergente. Cœterum erat tenuiſſima, lubrica & ſubtilis; animalculum abſcondens fig. 5. expreſſum, quod humorem fundebat ejuſdem cum teſtâ coloris; ipſi adhærebat firmiter aliquid ad inſtar ſpumæ viſcidæ, qua mediante aquæ innatabat ſuperficiei. Et hæc Cochlea marina ob colorem ſuum cœruleum adeo rara eſt, ut nullam huic ſimilem vel deſcriptam, vel in Cimeliis repoſitam, me obſervaſſe meminerim. Quin Doctiſſ. & Rev. Pater Bonannius in libro cui titulus, *Recreatione dell, Occhio &c.* Part 3. Probl. 35. ex eodem fundamento concluſerit non dari in rerum naturâ, nec poſſe dari ob rationes ab ipſo allatas, quæ loco citato fusè videri poſſunt.

Præter deſcripta hîc aquatilia coloris cœrulei omnia, frequentia quoq; apparebant animalcula ab Imperato Vela marina dicta perelegantia, itidem cœruleo imbuta colore, quæ etiamſi accuratiori examine digna ſint, hîc præteribo, ne navis meæ in hoc oceano fluctuantis vela, denuo horum commemoratione turgere incipiant, quæ lubens jam contraho. Supereſt ut prolixitatis literarum mearum à te petiam veniam; utinam tantâ in lectione earum perfunderes delectatione, quantâ ego in rerum, quæ iis includuntur obſervatione; ſed hoc prohibent, tum materiæ ſterilitas, quum inconditus ſtylus, cui ut ignoſcas, meq; & conatus meos qualeſcunq; Illuſtriſſ. Regiæ Societati ulteriùs de meliori notâ commendes, etiam atque etiam rogo. Vale, Vir Celeberrime, meq; ut cœpiſti, ama.

Dabam Patavii pridie Calend. Aprilis, 1704. Styl. nov.

III. *Part of a Letter from Mr* N. Regnart, *concerning a Pin found in the Gizard of a Fowl.*

Sir,

I Cannot but take notice to you of a particular accident, that ſeems to deſerve your Obſervation: Which is, that in cutting the Stomach or Gizard of a Fowl, finding ſomething reſiſted my Knife, upon examining it farther, I diſcover'd it to be a Pin, which the Pullet had ſwallowed,

and

and in all probability had lain in her ſome time: For it had pierced thro the Membrane on the inſide, and made a paſſage into the thick part, where it had form'd itſelf a Bed. It is obſervable, that the head of the Pin had paſt thro the firſt ſhrivell'd Membrane, but ſtopt at the ſecond, which ſeem'd more thick and Nervous; ſo that the Head remain'd incloſed between the two Membranes, the Body of it having made its way into the fleſhy Muſcular part. At the point there was form'd a *Callus*, of the bigneſs of a ſmall Pea, which ſeem'd a defence, that Nature had made to oppoſe it, as it was working itſelf farther.

It is not in the leaſt ſtrange that a Pin ſhould lye in the fleſhy parts, ſince we ſee a Muſquet-Ball will lye there a conſiderable time, without much injuring the part; but how it ſhould paſs thro the Membranes of the Stomach, without obſtructing its functions, and the Pullet thrive well after it, I leave you to determine.

IV. Olavi Rudbeckij Atlanticæ, *ſeu* Manheimij, *Pars Tertia. In qua vetuſtiſſima majorum noſtrorum Atlantidum lapidibus, fago, æri, ſive cortici Runas ſuas incidendi ratio, una cum tempore, quo illa primo cæperit, exponitur. Necnon Aurei numeri ſingulis annis tributi, & Signorum Cœleſtium, quæ abhinc ad Græcos & Latinos ſunt tranſlata, vera origo & ſignificatio traditur. Et illæ a diluvio Noachi primæ ætates, atque in illis prima* Atlantidum *noſtrorum forma deſcribuntur : quæ migrationes & bella ſub* Boreo, *ſeu* Saturno, *ejuſq; filio* Thoro *ſeu* Jove *geſta ſunt, recenſentur : & denique* Scytharum, Phœnicum & Amazonum *his ducibus in* Indo-Scythiam & Phœniciam *ſeu* Palæſtinam *e* Sueonia *factæ expeditiones enarrantur. Quibus omnibus mythologiæ perplures, quarum ſenſus in hunc uſque diem incognitus, hic demum detectus prodit, jucundæ ſane & perquam utiles adjunguntur.* Upſalæ *in fol.* 1698.

THis Learned Author divides this Third part of his *Atlantica* into thirteen Chapters. The firſt Chapter treats of the moſt Ancient Writings of the *Hyperboreans*, and the Cuſtom of the *Greeks*, and other Nations, of taking ſome things from them. Here the Author, before he gives us an account of the Antiquity of their *Runick Letters*, tells us of a fragment of an ancient

Writing on Velom, ſeen by *Ericus Schroderus*, *An.* 1637. and inſerted by him in his Preface to his *Lexicon Latino-Scandicum*, as follows. It happen'd *An. Chriſti* 1001. that *Olaus*, Monarch of the Northern World, well ſeeing the *Runick Letters* were the chief cauſe that the Chriſtian Religion had made no progreſs for about 185 years; when *Bero* the Third, King of *Sweden*, began to tranſplant it into the Kingdoms of *Scandia*, he call'd his Nobles together, and conſulted with them concerning a total aboliſhing of the *Runick Letters*, and ſubſtituting the *Latin Letters* in their ſtead; and it was carried in the Affirmative, thoſe Letters having maintain'd Idolatry, and the enormous Doctrine of the *Gentiles*, concerning the Gods of the *Barbarians*. Thus the *Runick Letters* being thrown by, together with a world of Monuments and Manuſcripts, no Tomb was ſet up after the ancient manner, nor no Monument erected, but all long neglected for ſeveral Centuries, till *John Buræus*, a *Swede*, and fortunate enquirer into the *Swediſh Antiquities*, began *An. Chriſti* 1598. laboriouſly to gather them from Aſtronomical Staffs, and the moſt ancient Rocks of *Sweden*, and ſome way to reſtore them to their ancient glory. The Author having given us this fragment concerning the ſuppreſſion, and reſtitution of the *Runick Letters* and Monuments, he proceeds to give an account of the Antiquity of them, and tells us that the ſaid *Schroder* in his foreſaid Preface ſaid the *Runes* were Invented by *Magog* the *Scythian*, and communicated to *Tuiſco*, chief Governour of the *Germans*, *An. M.* 1799. And he thinks it remarkable, that *Magog* is there mention'd Inventer of the *Runes*, at that particular time that himſelf has ſhewn, in his precedent Volume, from *Pliny*, *Wormius*, and their own Writings, that *Atlas* was one of the firſt Inventers of the *Runick Calendars*, from whom they are call'd *Atlas's Calendars, or Runſtaff's*; whom he makes alſo Inventer of the true Golden Number, betwixt the year of the World 1800 and 1900, which Number ſtands an un-

undoubted argument for the true age of the *Runick Calendars*, and the ſixteen *Runick Letters*, us'd by their Anceſtors in writing, and being more ancient than the Letters of moſt other Nations, eſpecially *European*, as many as have been ſeen to this day: And theſe Letters he ſays were formerly rightly call'd by the name of *Golden Apples*, kept by *Atlas*, till he communicated them to *Hercules*. And in anſwer to thoſe who pretend that the *Runick Letters* were a late Invention, he proves that the *Greeks* did not only uſe the Letters of their Anceſtors, but likewiſe took from them their common way of writing the ſame in the flexures, or windings of *Dragons* or *Serpents*, and often their common ways of Speaking. And to ſhew that their Anceſtors neither receiv'd their *Runes* from thoſe *Goths*, that came to them from *Pont Euxine* (as *Conringius* thought) where, formerly, going from them, they had ſeated themſelves; nor from the *Greeks*, *Latins*, or *Hebrews*; he here preſents us with a Table of the Letters of all theſe People, in which he has caus'd to be ſet down the Figure, Power, Order, Number, and Signification in numbring of each, which clearly ſets before the Eye what difference or ſimilitude there is betwixt them: And concludes it as a certain and undoubted truth, that there is no Nation in the whole World, known to us, or heard of, which by unanſwerable Reaſons and Monuments now in being, is able to ſhew, or produce Letters more ancient than theirs. On the contrary, he concludes the *Greeks* and *Phænicians* to have receiv'd their Letters from them; Ancient Writers teſtifying that *Ops*, in former Ages, carry'd the *Runick Letters*, cut in Braſs, to the *Greeks*; which the Author, in his firſt Volume, has ſhewn to have been before the time of *Moſes*.

Speaking of Sepulchral Monuments, plac'd on Hillocks where Men were Buried, and having Dragons and Epitaphs cut in thoſe Monuments, the Treaſures of the perſons deceas'd being Buried with the Aſhes of them in the ſaid Hillocks; he ſays it was from this Cuſtom of their Anceſtors, that came that ſolemn ſtory of Dragons lying on Gold; the *Greeks* and *Latins* alſo, by a common conſent, affirming the *Genius* of a place to be worſhipp'd under the form of a Serpent. So *Servius* on the fifth *Æneid*, *No place is without a Genius, which is commonly ſhewn by a Serpent:* And ſo *Perſ. Sat.* 1. *Pinge duos angues; pueri Sacer eſt locus.* As to the time that Letters began firſt to be commonly cut on the Spires of Serpents cut in Rocks, and of the report of dead men being turn'd into Dragons, he ſays we muſt look back to the times of *Cadmus*, whom he has prov'd to have liv'd in the time of *Moſes*, and to have been deſcended of a *Scythian Race*; and who, with his Wife *Hermione* (as *Bochartus* tells us) were reported to have been turn'd into Snakes, becauſe they had two Snakes of Stone erected in honour of them, by the *Phœnicians*. And if they are ſaid by others to have been turn'd into Lyons, we muſt note, that in the *Runick* Monumental Stones, within the forms of Dragons and Serpents cut towards the outſides of them, there were alſo wont to be cut in them by their Anceſtors the Images of Lyons, Horſes, Griffins, Dogs, Hawks, and other Animals; and this to denote the dead perſons Warlike Valour, Skill in Horſemanſhip, Pyracy, Robbing, Hunting, *&c.* So he ſays Ships are alſo vulgarly ſaid to be turn'd into Stones; becauſe in honour of perſons deceas'd, who had been famous for Sea-fights and Pyracy, a Stone was erected, with the Image of a Ship cut in it; of which Stones they have great plenty.

And hence he thinks it eaſie to ſee that the Fables, *Ænigma's*, or Ancient Acts of the *Syrians*, *Ægyptians*, *Greeks* and *Latins* can ſcarce be underſtood by any Man, unleſs he has firſt got good skill in their Tongue, and their peculiar ways of Speaking and Writing, and of their Ancient Monuments, and other things of that kind.

Having told us, that their Anceſtors were wont to cut their *Runick* Letters on Stones and Braſs (as *Plato* alſo teſtifies from the Tables of *Iſis* or *Diſa*, carried from the *Hyperboreans* to the Iſle of *Delos*, belonging to the *Greeks*) he ſays, as for the Wood, which their Anceſtors chiefly us'd for cutting their Laws on, and making their *Runſtaffs*, and delineating their Sea-Charts, it was of *Beech*, or the *Service-Tree*: Even *Kircher*, a Foreigner, teſtifying it concerning the former, and ſaying that thence even to this day in the Northern Countries they call a Book *Buech*, a *Beech* being call'd *Buecbaus*: As for the *Service-tree*, it's call'd in the *Gothick*, *Roon*, *Runebarſtra*, taking its name from the *Runes* themſelves, and is much eſteem'd, as having a peculior property for that uſe, as may be ſeen in the Author. From what he has ſaid concerning cutting in a *Beech* the Spires of Serpents, Letters, and Sea-Charts, he ſays we have an eaſy Senſe of a paſſage in *Orpheus* concerning a *Speaking-Beech*, and of the *Speaking Beeches* at *Dodona*, the latter implying no more, but that the *Flamines Diales*, or Prieſts cut Letters on Tables of *Beech*, in the form of a Serpent, by which future things were told to thoſe that conſulted the Oracle: Whence alſo Serpents were ſaid to give Anſwers, or Oracles, inſtead of Gods.

He adds one thing here, to corroborate what he ſaid in his firſt Volume, *viz.* that the Letter I, in nature of a prop, is the firſt of all the reſt of the Letters, the reſt being form'd of it, with Knees (*Knan*) being added to it. Now he ſays the Bird *Ibis*, call'd by them a *Stork*, by reaſon of his ſubtilty in finding out and devouring Serpents, is wont to be Pictured with his long Bill, holding a Serpent winding itſelf about it, after the ſame manner as it's ſeen in *Mercury*'s *Caduceus*: As therefore this Bird is called *Ibis*, ſo by this ſame *Mercury* would teach the *Ægyptians* that the Letter I, which is the firſt in the word *Ibis*, denotes I to be the prop to all the other Letters, in their *Runick* Learning. By the long Bill of that Bird, *Mercury* would denote the Letter I's having the figure of a Staff, and the Serpent winding itſelf about the ſaid Bill, denotes only the formation of the reſt of the Letters; ſo that as the divers flexures and curvities of the Serpent are in regard to the Bill, ſo is I in regard of all the Letters, form'd by the various Knees (*Kna*) in the prop I. Moreover, by the Serpent itſelf, that common way of their Anceſtors of cutting Letters in the figures of Serpents is intimated.

From what he has intimated from the flexures of Serpents, and *Runes* cut in them, he ſays a man may alſo eaſily underſtand, why *Atin*, that is, *Minerva*, who is alſo called *Pallas*, wore Serpents on her Garments, *viz.* it being well known that *Minerva* is the Preſident of Sciences and Letters, which the Author has ſhewn more than once to have been wont to be cut on the Spires and Skins of Serpents; ſhe was accounted a Goddeſs by the Learned. Therefore it's worthy obſervation, that in her Helmet a Serpent is ſeen, markt as it were with *Runick* Letters; this only denoting, that from the Brain Judgment and Knowledge is drawn, for expounding memorable things.

He tells us alſo, that from ſeveral Monuments taken from the Sepulchres of their Anceſtors, he finds it was uſual with them to frame in the Boſſes of their Bucklers, made of Braſs, one or more Heads of *Meduſa*, appearing frightful from the twiſted Serpents about it, and *Runick* Characters cut on it, whereby they render'd themſelves Invincible againſt any force of Weapons: And he ſays, their Heroes, who went from their Country Eaſtward, pleas'd themſelves in carrying ſuch; among whom he counts the Valiant *Agamemnon*, deſcended, as the Author makes out, from their Anceſtors.

Proceeding to give an account of the Writings of their Anceſtors on Parchment, he ſays they can ſcarce find any Writer of theirs more ancient than him mention'd in ancient Hiſtories, call'd ſometimes *Zennoner*, ſometimes *Semunder*, *&c.* being born in *Iſland* about the year of *Chriſt*

1057. His Works conſiſting of meer Rhimes involv'd in obſcure Fables, that he is now ſcarce underſtood by the late *Iſland* Poets, by whom the ancient *Iſland* Tongue by degrees has been deprav'd, by introducing new words: The Author, conſidering the Writings of this *Semnothes*, or *Semundur*, and the form of Words, eſpecially that part of his Writings, which is call'd *Volupa*, expounding things done near the times of the Deſtruction of *Troy*, agrees in judgment with *Reſenius*, *viz.* that *Saxo* had another *Edda*, more ancient, and fuller of fabulous relations, than the *Edda* of *Semundus*, or *Snorro*, *Olaus Magnus* owning ſuch an one to have been, and of which the preſent *Edda* is a ſort of *Compendium*: And concludes that this *Semundus*, who liv'd about the year 1050, drew what he writ from another more ancient than himſelf, and is wholly of opinion that there once was one of the moſt antient of their Predeceſſors in the North uſually ſtil'd King, or God, call'd *Semnon*, or *Sem*, from whom (as he has ſhewn elſewhere) the Royal Family, and all the moſt ancient and noble perſons were call'd *Semungar* (*Semnones*) and whoſe Verſes were celebrated by the Traditions of many: And others after him upon reading his Writings have got much Wiſdom, and encreaſing them with the Hiſtories of their Times, and keeping his form of Writing, either aſſum'd his Name, or were given it by the People. Now, he ſays, if we diligently look over all the Writings aſcrib'd to the *Semnones*, we ſhall find no ſmall diverſity betwixt the form of that moſt ancient *Semundus*, or *Semnon*, and the reſt of the *Semundi* that follow'd him; beſide that the firſt of them compos'd his Hiſtory a long while before the *Trojan War*; the ſecond came near the Age of the *Trojans*; a third brought his Writings to the times of *Alexander the Great*; the laſt, which the Author has ſeen, reaches the firſt years of Chriſtianity: And therefore he willingly ſubſcribes to the opinion of theſe *Iſlanders*, who conclude the *Edda* of the moſt ancient *Semundus* was writ by the *Aſa's*, that is, by the Gods, *viz.* their God, or King *Semnon* and his Progeny; which Opinion is ſtrengthen'd by the Teſtimony of *Laertius*, ſaying, that among the *Celtes* and *Gauls* Philoſophy had its riſe from the *Druids*, or thoſe are call'd *Semnothei*: And as for the firſt places of abode of the *Celtes*, *Gauls*, *Semnons* and *Druides*, he has intimated before.

In his ſecond Chapter he treats of the force of the *Golden Number*, in foretelling various things, which in his ſecond part of his *Alantica* he had promis'd to give an account of here. Which having done, he concludes this Chapter thus; the things I have related here, obſerv'd by our Anceſtors, concerning the *Golden Number*, are not therefore brought, that I think there is in it a greater force in foretelling future things, or more ſecret efficacy, than in the other conjunctions of the Planets; but ſimply to ſet forth what our Anceſtors thought concerning the motion of the Heavens and the Stars, on which account they were much celebrated by the *Greeks*.

The Third Chapter treats of the Celeſtial Signs, whereof the chief, he ſays, owe their firſt riſe to *Sweden*. Here he ſets forth, that *Atlas*, an Inhabitant of their Northern *Lybia*, was the Inventer of Aſtrology, and of the Sphere, or motion of the Heavens; and that where *Hercules* is ſaid to have taken away the *Golden Apples*, there kept by a Dragon, he learnt this Skill of Aſtrology from *Atlas*; and as for the Dragon, he ſays it's worth noting that their Anceſtors were wont to deſcribe the keeping of the *Golden Apples* in the North by a Dragon, in a threefold reſpect; for they call'd their *Runick Stones* by the name of *Golden Apples*, as being cut with Letters, the preſervers of Immortality; which Letters they ſaid were kept within the Spires of Serpents. 2. They repreſented the whole *Baltick*, as a Dragon winding himſelf about all the Iſland, and keeping theſe Golden Apples. 3. The range of Stars, compaſſing about both the Bears in Heaven, had the name and form of a Dragon given them by their Anceſtors, which they circumſcrib'd within the ſpace betwixt the 51 and 53 degrees of elevation, within which Dragon *Sweden*, together with the *Baltick Sea*, extends itſelf in an equal ſpace. As for thoſe that would ſee the form of their *Baltick Sea*, ſet forth under the figure of *Hercules* and a Dragon, he refers them to that ancient Monument ſet forth in *Begerus*'s *Spicilegium Antiquitatis*; where *Hercules* appears clad with a Lyons Skin, and holding in one hand a Club, and in the other a Golden Apple, having a Dragon under it, from whoſe Belly and Feet a vaſt River flows, by which artifice their *Baltick* Sea is denoted, going under the name of a Dragon.

As for the Signs of the Zodiack, he ſays neither the *Chaldæans*, *Aſſyrians*, *Greeks* nor *Latins* have aſſign'd any cauſe why the Names and Images of *Aries*, *Taurus*, *Gemini*, *&c.* are given them, rather than thoſe of Kings and Valiant Heroes: Nor can the account of theſe be adjuſted to any Country ſo well as to their North: Having regard to their way of computing the Year, he begins with *Capricorn:* By this he ſays their Anceſtors would denote nothing but their *Juul Goat*, *Julen ſoocken*; and therefore in their *Runick Calendar* at the beginning of the Year they have pictur'd the Horn of this Goat, which they us'd in their drinkings as a peculiar Symbol of Joy for the revolution of the Sun. Then alſo they were wont to call Councils for undertaking Wars, which alſo was intimated by the figure of a Goat, or *Capricorn*, and ſo the Names of Goat and Horn gave the Name of *Capricorn*. Now neither the *Aſſyrians*, *Ægyptians*, *Greeks* nor *Latins*, in the firſt times began their Year from *Capricorn*; but borrowed this Cuſtom from the North a long time after. Next *Capricorn* comes *Aquarius*, which is wont to be painted Emptying a great Pot of Water: for while the Sun is in this Sign the cold relaxes, and the Snow melts on the thirteenth day of the Feaſt *Juul*, and the Earth in the month of *February* produces great Rains

or

or deep Snows; upon diſſolving of which by the growing warmth, towards the end of *Aquarius*, many Rivers are every where diſcover'd. The *Ægyptians* cannot claim this Sign to themſelves, becauſe the Inundation of the *Nile* begins with the Ingreſs of the Sun into *Cancer*, and is compleated in 100 days; nor have they any Rains, or very rarely. In other Countries towards the South, *viz. Greece*, *Syria*, *Italy* and *Spain*, where-ever Snow falls, it preſently melts, while the Sun is in *Capricorn*. The Sign *Piſces* is moſt aptly plac'd next, becauſe aſſoon as the fattiſh fruitful moiſture of the melted Snow, from various Places of the Lands, ſubſides and flows to the Ponds and Torrents, the Fiſhes, drawn by its ſweetneſs, betake themſelves to the Shores, and growing luſtful, there engender: and their ancient Country-men obſerv'd this time of the year as moſt proper for Fiſhing; whereas the *Ægyptians* take Fiſh chiefly when the *Nile* overflows, *viz.* in the months of *June* and *July*, and eſpecially in *November*: therefore they could not be the Inventers of this Sign. The fourth place is given to *Aries*, which Sign denotes the time, when the Snows being melted, Sheep, Goats, Swine and the like, are put to feed abroad. Now, this reaſon can ſcarce hold in any other Country, eſpecially Southern; for in *Germany* Cattel feed abroad almoſt all the Winter, and ſo in *Aſſyria*, *Ægypt*, *&c.* *Taurus* is aptly made the fifth Sign, anſwering to the midſt of *April*, and the midſt of *May*, becauſe Cows and the like cannot be ſent out to Paſtures till the Graſs is pretty high, which in their Country is not till the ſaid months, near the Summer. Nor can the Southern Countries claim this reaſon, for with them, from *February* and *March*, and in *Greece*, *Italy*, *Spain*, *Judea* and *Ægypt*, all kinds of Herds may live abroad all the year. And by this Sign of the Bull, Antiquity would intimate, that at this time the Earth is Plowed and Sown with Barley, which in *Germany* is uſually done in the month of *March*; and in *Judea* and *Ægypt* it's now in Ear. The ſixth Sign is the Naked *Twins*, denoting that when the Sun is come to this Sign, the Water is ſo warm, that Children may then freely waſh themſelves in Rivers and Lakes, alſo that Saylors may then night and day ſet to Sea; for by theſe *Twins* they chiefly denoted *Caſtor* and *Pollux* (*Gaſtor ock Boldur*) thoſe moſt skilful Maſters of Sea Affairs, of whom the former kept watch by Night, the latter by Day. Nor can any Southern Man, with ſolid Reaſon, ſay that thoſe things belong to them. The *Æthiopians* and *Ægyptians* may waſh themſelves in Rivers all the year, and in other parts of the World, Sailers may ſet to Sea as well in Winter as Summer: But in his Country it's very rarely the Seas or Lakes are open to Sailers, before the Sun enters this Sign. The Seventh Sign is *Cancer*, in which the Sun is ſaid to turn his courſe, and go backward like a Crab. Now, tho with other Nations the Sun goes away and returns, yet with them the Sun never is in a degree of Latitude in Heaven, to enlighten whole Nights with his Rays, nor going away does he cauſe ſo laſting darkneſs, as to ſeem wholly as it were to be held under; ſo that his going Crab-like and return are more ſenſible to them. The eighth Sign is called the *Lyon* or *Dog*, chiefly for this reaſon, that at this time of the year, when the Sun is in *Sirius*, whatſoever Animals are killed, and are not preſently preſerv'd, either by Boyling, Roaſting or Baking, for Humane uſe, they are preſently corrupted or conſum'd by the heat of the Sun, as by a Lyon or Dog, the moſt voracious and fiery of Animals; and tho in other Countries Fleſh at this time rots and conſumes, yet there the heat of the Sun is more laſting than to anſwer but to one Sign; for with ſome it laſts 3, with others 4, nay, and 5 months, whereas in the Northern Countries it ſcarce preſſes but while the Sun ſtays in that Sign; wherefore this month with them is peculiarly called *Rotemanem Rotmonth.* The ninth Sign is expreſt by the Image of a *Virgin*, holding in her hand an Ear of Corn, intimating that then is the time of Harveſt, *viz.* in their *Auguſt.* Now this cannot be aſſigned to *Ægypt* or *Aſſyria,* they gathering their Haveſt in *April*, *May* and *June*; and the *Greeks*, *Italians* and *Spaniards* do it a whole month before the North. *Libra,* the tenth Sign is aptly joyned to the foregoing, anſwering to the months of *September* and *October*, becauſe after Husbandmen had gathered a plentiful Harveſt, and Thraſht out ſome Corn, they commenc'd *Fairs*, and changing their Goods, get Salt, Fleſh and Fiſh for their Corn, all which things are done by the *Balance*, or *Scales*, as may be ſeen in the moſt antient Laws of their Country. And therefore at this day in the Metropolis of *Sweden*, *Stockholm*, and elſewhere, the greateſt *Fairs* throughout the Kingdom are yearly kept about this time, for ſuch changes; whereas in other Countries he ſcarce thinks ſuch a Merchandizing, by change of Corn, proper at this time, their Harveſts being gather'd long before. The eleventh Sign is the *Scorpion*, an Animal infamous for ſtinging and killing: By this the Ancients would intimate, that the power of the Sun and Earth was now wholly become dead; the Sun in the fartheſt parts of *Sweden* lying hid under the Horizon for many whole days and nights together, the Earth being Frozen, and cover'd with Snow, producing no Fruits, and ſo lying as a dead Carcaſs. Now, with the *Ægyptians* and *Aſſyrians* Fruits, and Plants are at this time at their chief growth, for in *January* or *February* their ſtanding Corn begins to ſhoot forth into Ears. The Twelfth Sign is *Sagittarius*, becauſe that time in the North is fitteſt for Hunting, the Snow there fallen at that time being but thin and unfrozen, ſo that they clearly ſhow the footſteps of wild Beaſts, and give a free paſſage to Hunters in the Woods: Whereas in the months of *January* and *February*, ſo great Snows fall, that they make Hunting very uneaſy and difficult. Nor can the *Ægyptians*, or *Aſſyrians* aſſert the Invention of this Sign to themſelves, Snows being in a manner unknown to them, and rare in *Italy* and *Greece*, and

fall

fell not but in *January*, and lye ſecure without melting: The Sun alſo being entred into another Sign, *viz.*, *Capricorn.* From all theſe things the Author thinks it clearly appears that the nature of the Signs, and the Names and Images given them, are ſo order'd, that they ſhew what muſt be duly and orderly done by Husbandmen in each part of the year in their Oeconomical affairs, and this according to the nature of the Country: And as their Ancients thought nothing more neceſſary for the ſupport of Mortals than the Cultivation of the Earth, ſo they thought nothing more conducing to that, than a diligent obſervation of the Sun and Stars, as they act on theſe Sublunary Bodies.

The Author next proceeds to give an account of certain Monuments of Stone, of the *Ægyptians*, *Greeks* and *Romans*; from which he ſtrengthens what he has ſaid concerning the 12 Cœleſtial Signs, and the Oeconomical Reaſons of them: And next conſiders the later *Almanacks*, both thoſe that were written on Parchment by Monks, or others, us'd in their Country when Chriſtianity was firſt introduc'd there, about the year 800: the uſe of the *Runſtaffs* being then by degrees taken away. And alſo the late printed *Almanacks*, introduc'd with Printing, and ſhews what is retain'd in them of the Cœleſtial Signs of their Anceſtors, together with their explication, thereby to confirm what he had ſaid before. From the Signs of the Zodiack he paſſes to the other Celeſtial Signs, and ſays he has ſhewn in his precedent Volumes, that many of them had a Northern Original. As for the time that the knowledge of the Celeſtial Bodies, under the likeneſs and feign'd figures of Men and other Animals, came to the *Greeks*, *Chaldeans* and *Ægyptians*, ſome think *Hercules*, the Son of *Thor* or *Jupiter* and *Alcmena* carried it to them: But *Lucian* in his Tract of Aſtrology ſays this Knowledge is ancient, and the Invention of the Ancient Kings, whom the

Gods lov'd: And that the *Greeks* heard nothing of Aſtrology from the *Æthiopians* or *Ægyptians*; but *Orpheus*, the Son of *Oleagrus* and *Calliope*, firſt deliver'd thoſe things to them, tho he did it not clearly and openly, but cover'd them under certain myſtical Veils.

In the fourth Chapter, and the five following, the Author treats of the ſix Ages of the World. In this fourth he treats of the Golden Age, or the firſt Age from the beginning of the World. Here the Author ſays, he thinks thoſe of the Learned Chriſtians did well, who endeavour'd to induce the *Gentiles* to a belief of the Scriptures, from the Writings of the *Gentiles* themſelves, they containing a relation of many famous facts, which are confirm'd by the Scriptures: But, he ſays, if thoſe Doctors had began from the Genealogies of the ancient Pagan Kings, and ſhewn from the beginning, how theſe anſwer'd, Race by Race, to the Genealogies of the *Jews*, they would have made the Cœleſtial Doctrine more clear to them; ſince thence they might have collected, that he, to whom the fact of another was imputed, liv'd at the ſame time with him whoſe fact it was. And becauſe as far as he knows, no man has throughly handled this, he here propoſes to ſhew, beginning with the firſt Age after the Creation of the World, how, both their Anceſtors, and other Pagans, with reſpect to Poſterity, from one Generation to another, have propagated many things agreeing to Sacred Writ: For performing which, in his Accounts of the ſecond, third and fourth Age, he has given us three Chronological Tables. And in his Account of the *Golden Age* in this Chapter, he thinks it appears from the words of *Heſiod*, concerning that Age, joyn'd with the *Voluſpa*, and the Scriptures well conſider'd, that their Anceſtors were the firſt known for Empire in the World, and for their ſingular Wiſdom, Juſtice and Fortitude.

The fifth Chapter treats of the ſecond, or *Silver Age*, which he ſays was ended at the Deluge, by reaſon of Men's Crimes.

The ſixth Chapter treats of the third Age, call'd *Rocky* or *Stony*, mention'd in the *Voluſpa*: Which Age *Heſiod* ſeems to have made the *Brazen*; tho the reſt of the Ancient *Greek* and *Latin* Poets make ſome mention of it, call'd *Rocky*, becauſe *Noah's Ark* reſted on a Mountain, whence by the Northern Hiſtories and the *Scalds* the Men of this Age are ſaid to be ſprung or deſcended from Mountains: And whereas *Deucalion* and his Wife are ſaid to have thrown Stones over their Heads, whence Men and Women ſprung up, this he ſays denotes *Noah*'s Deſcent with his Family from Mount *Araret*, leaving the Mountain behind them.

The ſeventh Chapter treats of the fourth, or *Brazen*, or *Aſhen Age*; and began, he ſays, with their King *Maderus*, or *Mannus*; becauſe, by reaſon of his Strength and brawny Limbs, he was ſaid to be made of *Aſh*; or becauſe in his time their Anceſtors began to uſe Darts and Clubs of *Aſh*; the Deſtruction of *Thebes* or *Troy* putting an end to this Age.

The eighth Chapter treats concerning the fifth Age, or the Age of the Heroes. Here he ſays it's worth noting, that *Heſiod* ſays the *Heroes* that remain'd after this Age and the *Trojan War*, took their Seats in the moſt remote parts of the World, and in the *Elyſian Fields*, meaning their *Atlantica*. And this, he ſays, is moſt worthy to be noted, that after the deſtruction of *Troy*, and the return of the remaining *Heroes*, we can find none of the *Greek* and *Latin* Writers calling any King or Great Men of their own or other Nations by the Title of *Jupiter*, *Neptune*, *Hercules*, or *Pluto*: But as theſe were of the ſtock of their *Saturn*, *Jupiter*, *Atlas*, ſo theſe were only call'd by thoſe Names of the Gods. Some of thoſe *Heroes* marrying with foreign Mortal Women, had Children, which therefore were call'd *Demi-gods:* Their chief *Heroes* being ſaid to be Immortal, not that they did not dye, but becauſe they were thought to revive under the form of other Men. It's obſerv'd that after *Jupiter* return'd with the ſix Gods that accompany'd him from *Troy*, the uſe of his Name vaniſht alſo with the *Greeks*; whence the *Greek* Writers conclude, that after that time *Jupiter* cohabited no more with natural Women: He obſerves, it was the cuſtom of their ancient Kings and Giants not to marry with Women of a low ſtature, leaſt the Race ſhould expire, which cuſtom continued till the time of *Alexander the Great*; and this Cuſtom, he ſays, continued among the *Helſingi* till the beginning of the laſt Age (as he was told by the Governor of that Province) for which reaſon perhaps, they are ſeen, for the moſt part, to excel the reſt of the Inhabitants of *Sweden*, in bulk and ſtature to this day; whence if a Man be ſeen to exceed the common ſtature, it paſſes as a common Proverb, to call him a Long *Helſinger*.

The ninth Chapter treats of the Sixth or *Iron Age*. Here the Author quotes the *Voluſpa* and *Heſiod*, giving an account of this Age, in which all things were in confuſion, and by the words of the *Voluſpa*, this Age ſeems to be confounded in part with the former Age, and to end with the *Trojan War*.

The tenth Chapter treats of the firſt form of Government among the Northern Nations. Here the Author gives an account of the moſt Ancient of their Anceſtors that ſettled themſelves in *Sweden*; and this chiefly from the Scripture, and ſhews they were the Sons of *Japheth*, among whom the chief was *Gog*, which name he ſays, among them was a Title of Honour given to Kings, Heroes and Giants; and therefore the firſt of their Anceſtors being a Giant, was honour'd with that Title, and from the Poſterity of this *Gog*, many places of *Sweden* have drawn their names; of which he gives many inſtances: So the name of *Magog* or *Mangog*, in the *Swediſh* Tongue, ſignifies a Valiant and Stout Man; from whence many other places in *Sweden* have their names. So he ſays, *Meſhecus*, another of the Suns of *Japheth*, was the Progenitor of the *Finlanders*, who are moſt Northerly, whence they are ſtill called *Meſar*. As for the name of *Finlanders*, they have it from the *Swedes*; and he mentions ſeveral places in *Finland* that have their name from *Meſhecus*: And ſo from other Sons of *Japheth* other places in *Sweden* have their names.

He tells us, *Greece*, *Aſia*, *India* and *Ægypt* took the word *Pygmy* from their Country, chiefly from the *Finlanders*; for theſe and the *Swedes* call Boys from the 7th or 8th to the 11th or 12th year *Pyckior* and *Poikar*, and Girls *Pigor* and *Pikar*; and Men by the *Swedes* are called *Man*; by the *Finlanders Mias*: Hence therefore *Pygman*, or *Pygmias*, or *Poikmias* ſignify one in Stature a Boy, but in Age a Man; and ſo from the *Laplanders* and *Finlanders* the word Πυγμαῖος came to the *Greeks*.

He obſerves, that as no Nation in the World has been ſo prone to Parables and obſcure deſcription of things, as the *Swedes*; ſo they are now moſt tenacious of their ancient Cuſtom, which, both a common Book fill'd with Ænigmatical queſtions, and in a manner all the *Epithalamia* that come forth, ſufficiently prove.

He tells us from *Scroder*, that *Magog* was the Inventer of the *Runes*; and ſays there is no room for doubting, but *Atinus*, *Atlas* and *Magog* were one and the ſame perſon. And after having given a large account of the extent of the ancient Dominions belonging to the Northern Inhabitants, he ſays, as for the Sons and Grandchildren of *Magog*, or their firſt *Atlas*, their Names writers do not well agree; yet in the ſixth Generation they do much differ: For he that by *Heſiod* and *Apollodorus* is called *Cælius*, is the ſame that his Country-men and the *Iſlanders* call *Kelius*, *Uran-kolle*, *Bune*, *Bariki*; and this is the firſt to whom their Anceſtors aſcribe the firſt form of *Swediſh* Government.

Being convinced of a Gigantick Race of Men, by many vaſt Skeletons he had found in Sepulchral Monuments, he gives inſtances of ſeveral Giants of a vaſt Stature, who about the time of *Alexander the Great* grew leſs, the *Goths* about that time returning from South *Scythia*, or *Turkey* and *Aſia*, being men of a leſſer ſtature, and cauſing a mixture of divers Nations; and he thinks he may ſafely ſay, that before the times of Chriſt, the Men of their Country were 5 or 6 of their Ells in height, which he confirms by many Teſtimonies.

Speaking of their *Cumæ*, which lyes beyond the *Baltick*, over againſt *Phlægra*, he ſays it was known formerly for horrible Magick, and the Impoſtures of Witches; where *Ulyſſes* and *Æneas* were ſeduc'd, conſulting the old Fate-telling *Cumæan Sibyl*, call'd the Prophetеſs of *Hell*, becauſe ſhe liv'd in the remoteſt part North, as it were in a Subterraneous place: This Sibyl being different from the *Cumæan Sibyl* of *Italy*.

Having ſhewn in his former Volumes, that the Croſs was in uſe in the firſt times, and cut in moſt of their *Runick* Monuments; this he ſays Intimated to Poſterity, that in thoſe Tombs were laid the Bones of Commanders, and Men famous for Valour both by Sea and Land, who, while alive, with a vigorous Arm manag'd the Club of *Thor* or *Jupiter*, made like a Croſs.

The eleventh Chapter treats of the form of Government of the *Atlanticks*, under *Saturn*, and his Expedition. Here the Author, after a long ſearch into the origin of the word *Chetim*, finds that as ſome call'd the *Goths*, *Gothi*, *Gythæ*, *Getæ*, ſo they call'd their Land *Gutheim*, *Gythiam*, *Chetim*; whence he thinks he has made it plain that *Chitim*, the Son of *Javan*, Grandſon of *Japheth*, and Great

Grandſon of *Noah*, choſe that Country for his Seat, and gave it his Name: He had a Son whoſe Name was *Cælius*, or *Uranus*, who had *Saturn* or *Boreus*, under whom was the Golden Age. This *Saturn* had many Children and Grand-children, whom he made Petty Kings, and carried ſome with him in his Expeditions, and made them Kings abroad over the Nations he conquer'd, hence they were called *Tiodanar*, *Titans*, that is, Kings of People; which Celebrated Name paſt to the *Greeks*, *Pherecydes* calling them *Hyperborean Titans*, and the Poet Subterraneous Gods, or who poſſeſt the Seats of the *Inferi*, in the fartheſt parts North. Now tho *Sweden* had many *Titans*, yet the Houſe of *Atinus* or *Neptune* had this Prerogative, that all *Sweden* was divided into ten Countries, according to the number of his Sons, and the chief Empire was in them and their Progeny, and one of them was choſen as Monarch; whence they were called *Kurar*, Electors. Thoſe petty Kings or *Cures* at firſt being ten, were afterward increas'd to twelve, with a preſiding Monarch. When theſe 12 Gods with their Preſident were to ſit in Judgment, they chiefly made choice to ſit under an *Aſh*, by reaſon of the wonderful order of its Leaves, there being ſix Leaves on each ſide the Stalk, and one on the top, fitly anſwering to that Seſſion of the Gods: He alſo notes that Ships with them were call'd *Askar*, becauſe built of *Aſh*; and ſays the name of this Tree is taken from *As*, a Divine Title, becauſe it gives a refreſhing ſhade to the Gods, as they ſit to diſpenſe their Laws. He tells us alſo, they made their Tribunals on the tops of Mountains and Hills, and guarded them with Stones ſet in a Circle about them, of which Circles there are ſtill many to be ſeen in his Country.

Speaking concerning the recourſe of Foreigners to *Sweden*, to conſult the Gods concerning paſt and future things, he gives us ſome of the chief of their Cuſtoms, agreeing with what the *Greeks* and *Latins* write. The

Golden Apples, reſtoring the Gods themſelves to life, that is, which ſet forth the Acts of their Anceſtors, and incitements to Virtue, and diſſwaſives from Vice, are Interpreted by him of Letters, which were cut on Stones or Wood, or writ on Parchment. And theſe Stones, Tables, Parchments and *Lapland Tympana*, from their oblong figure, have got the Name of Pine Apples, Apples and Eggs: And thoſe Letters that were writ on Parchment or Magical *Tympana*, were cover'd with a Gold colour, from the Bark of an *Alder*: Therefore that *Alder* was much eſteem'd by their Anceſtors, and is now by the *Laplanders*; ſince from its Inward Bark, ground with the Teeth, they get a Gold colour, wherewith they Paint all kinds of Letters and figures on their *Tympana*. Now, as for what ſome are ſaid to deſcend into Hell carried on *Alder* Sticks, it is from thence, that in their Divinations they uſe thoſe kinds of Sticks, in the Barks of which they had cut Letters and Circles, compaſſing about the Stick, like the various Spires of Serpents. As for the God they call upon in theſe Divinations, he ſays it's *Saturn*, and his Worſhippers uſing the Drum are call'd *Saturnines*. Therefore he that by the help of the Drum would ſeek counſel of the Gods, takes in one hand a *Golden Apple*, in the other a Hammer made like a Croſs of *Alder*, or *Horn*, he ought alſo to have a Serpent, made of Copper, as not much differing from Gold in colour, which upon the beat of the Hammer on the head of the Drum, leaps in and out, till it ſettles on ſome Letter or Figure, ſhewing that to be it, from whence the Anſwer is given. Moreover, the *Saturnine*, upon beating the Drum a while, fell into a Trance, as tho he were dead; and the *Laplanders* then, by miſtake, thought the Soul went out of the Body, and having learnt many things, return'd again; whereas their Anceſtors, with *Plutarch*, thought the Soul did not go out of the Body, but ſome time yielded, and gave a looſe to the *Genius*, which having roll'd about inwardly, told it many things it had ſeen and heard without. Now the things they deſire to ſee are of various kinds, either the Souls of the Dead, or the Actions of Men at a great diſtance, or paſt or future things. And he gives inſtances of ſome perſons who came from other Countries to theirs, to ſee the Ghoſts of their Anceſtors rais'd after this manner. And *Plato* owns that all the Tradition concerning the *Elyſian Fields* and *Hell* owes its riſe to their North, which being cut on a Table of Braſs, was carried by *Ops* from the *Hyperboreans* to *Delos*, belonging to the *Greeks*.

The twelfth Chapter treats of *Jupiter*, and his form of Government, and Expeditions at ſeveral times about the year of the World 2100. The Author having prov'd by many ſtrong Arguments in his precedent Volumes, that *Jupiter* was the Son of *Saturn* in *Sweden*, and held his Empire there; he undertakes to ſhew here that he went thence to other Countries and ſubdued them, which has been the occaſion various Nations and Cities claiming his place of Birth and Sepulchre to themſelves; among whom he firſt numbers thoſe of *Crete*. Beſides what he has ſaid in his precedent Volumes to prove *Jupiter* to have been of their Country, he ſays many Names given him by his Country-men as well as Foreigners prove it. As 1. The name of *Thys* and *Thyſſon*. 2. *Dian*, which name was alſo common to the 12 Gods or *Druids* conſtituted by him to judge the People, and take care of Sacred Rites. 3. *Thor*, from which name various Cities, Villages, Places of Judicature, Groves, Lakes, Kings and other Illuſtrious Perſons afterwards drew their Names. And their Anceſtors conveyed this Royal Name of *Thor* to the *Greeks* and *Latins*, of which he gives ſeveral inſtances. So he ſays the Town *Thordona* or *Tortona* in *Greece*, called by the *Greeks Dodona*, was built by *Thor*; ſo that the moſt ancient Oracle of the *Greeks*, in which

Thorus or *Jupiter* was worſhipt, was called *Tortona* or *Dodone*, the Origin of which name the *Greeks* could not find; and no wonder, ſince they conſulting the Oracle concerning the names to be given the Gods were anſwered, that they muſt uſe the barbarous names. *Thor*, he ſays, among other names given him, was call'd *Fluge-guden*, from his driving away Magical Flies with his Hammer; the name *Fluge-guden* being the ſame with *Belzebub*, mentioned in the Scriptures. As for the Magical Flies, they were *Dæmons* in the Shape of Blue Flies, which the *Finlanders* kept in a Magical Pouch or Satchel, they being call'd by them *Gan*, that is Spirits, which they daily ſent forth for their Magical uſes, *viz.* to bring them news from all parts of the Univerſe, and to do things deſtructive to Men, *&c.* And theſe Flies were driven away by ſacrificing to *Thor*, tho the Victims offer'd by the *Jews* in the Temple at *Hieruſalem* were freed from Flies, by reaſon of the *Jews* Faith in God. He gives us other Titles of *Thor*, and teaches us many other things from the Ætymology of Names, too long for me to ſet down.

The thirteenth Chapter treats of the migration of the *Atlantiques* under *Jupiter*, *Bacchus*, *Inachus* and others, to divers parts of the World, as *Thracia*, *Bactra*, *Ægypt*, but eſpecially into *Phœnicia.*

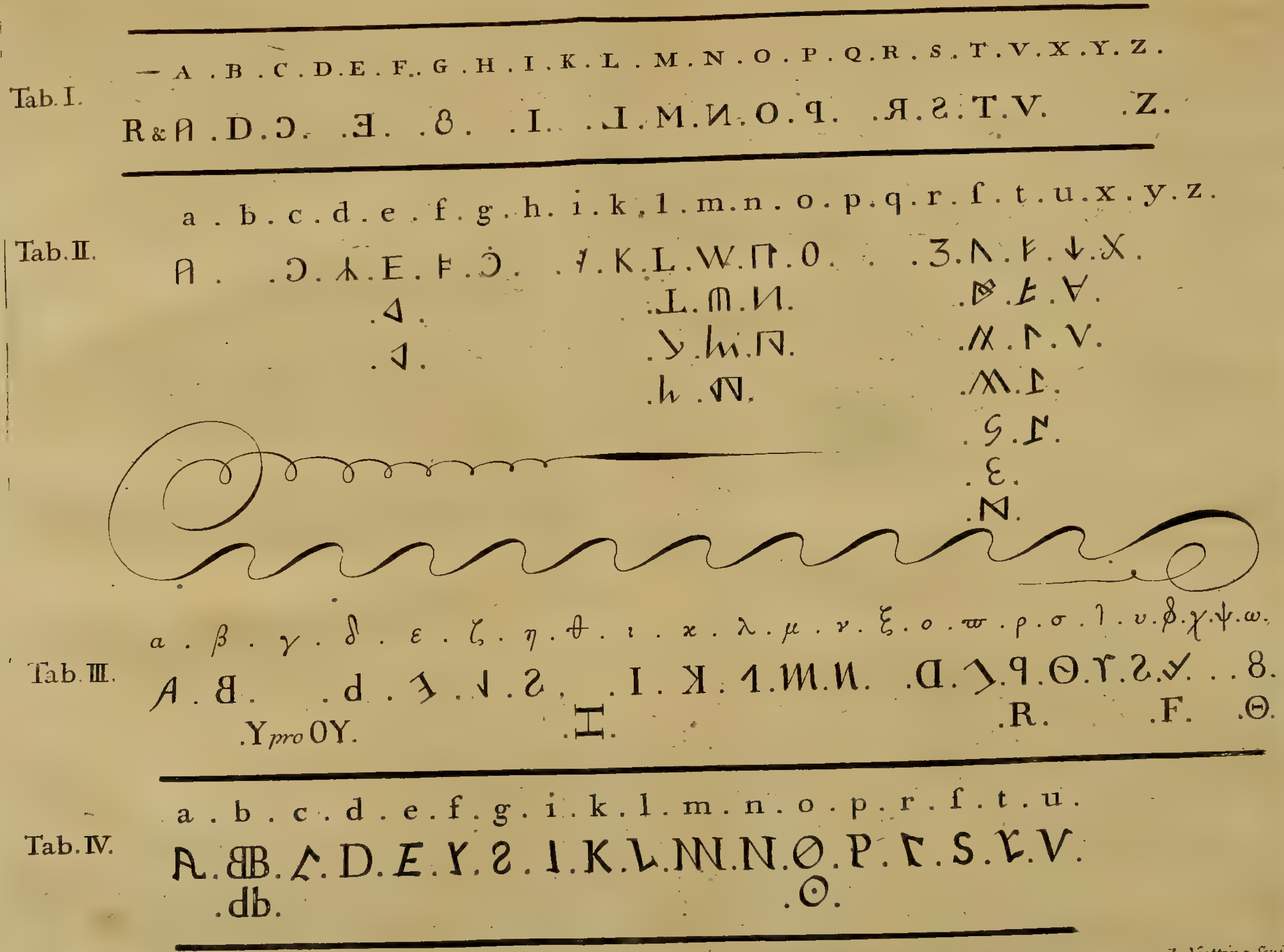
Here the Author ſets forth, that *Jupiter* having got a notable Victory over the *Giants* and *Amazons*, mention'd in the precedent Chapter, this ſtruck a terror into other Nations; and therefore the remaining Giants, and all of the Royal Family, whom he had driven out of *Sweden*, fortify'd themſelves abroad; and as they oppreſt all men by Sea and Land, *Jupiter* being call'd to the aſſiſtance of the oppreſt, at length ſubdued them, whereupon his Fame grew throughout the World: And he undertook many Expeditions, cauſing two Goats (*Bacchi*) to be made, whereof one was like a *Roman* Battering Ram, to batter down their Fortifications, which were made of Stones without Mortar, or of Wood and Dirt: The other was for caſting Fire out of it, whence he conceives the *Greeks* made their Monſter *Chimæra*; and of which two Engines he gives a particular deſcription. And tells us, *Jupiter*, or *Thor*, *Oſiris* and *Bacchus*, are but divers appellations of one and the ſame Son ſprung from *Saturn*. And the ſole reaſon why *Bacchus* is pictur'd with Horns, is that he was formidable both by Land and Sea to Enemies, for his moſt ſharp and ſtrong Horns. And their Anceſtors call'd Ships by the Names of Cattel, Bulls and Cows, and ſuch were the Cattel of *Gerion*, which *Hercules* took from him.

He ſays he has ſhewn before that *Neptune* by them was call'd *Oggur*, *Aggerus*, *Hacon*, *Ake*, *&c.* And the Kingdom of *Sweden*, *Ogyheim*, *Ogyeia* (*Ogygia*) and that under him, and in the times of his Brethren and Anceſtors thoſe great Expeditions were made throughout the World with Ships, for the moſt part by Rivers, Seas and Lakes, which by the Writers of the *Gentiles* were call'd Inundations of Waters.

From the *Phœnician Language* he conceives we may draw a moſt firm Argument that they are a Colony of theirs; what he has ſaid before concerning the race of the *Phœnicians*, and the greatneſs and colour of their Bodies, confirming the ſame. And therefore, leſt any people in the North, or neighbouring to the *Phœnicians*, ſhould claim this Glory to themſelves, he adds here for a cloſe a *Table* of ſome words in the Chief and Mother Tongues of the reſt; that theſe being compar'd with the *Runick* or *Phœnician Words*, it may clearly appear how cloſe an Allegiance there is betwixt the *Scythian* or *Swediſh*, and the *Phœnician Languages*. Now theſe moſt Ancient Tongues, to which in a manner all the reſt owe their Birth, are theſe; the *Scythian* or *Swediſh*, the *Runick* or *Phœnician*, the *German*,

man, *Hebrew*, *Greek*, *Latin*, *Sclavonian* and *Finnick.* Many words of each of which he has given us in a Table, which being compar'd together, the *Phœnician Language* appears to be in a manner the ſame with the *Scythian* or *Swediſh.* Moreover, by conſidering the Divine Worſhip, Cuſtoms and Letters of the *Phœnicians*, he finds they owe their riſe to the *Scythians.* As for the time of this Expedition of *Thor* and *Bacchus*, whom, as well as his chief Deputies, *Mercurius*, *Inachus*, and the reſt, the Poets call by the Names of *Hercules*, *Faneſius*, *Dionyſius* and *Titan*, he concludes it to have fallen in with the times of *Abraham*, and his Great Grandfather *Saruck*, with which he finds the Scriptures to agree.

London, Printed for *Sam. Smith* and *Benj. Walford*, Printers
to the Royal Society, at the *Princes Arms* in *St Paul's*
Church-yard, 1705.


Tab. I.
— A . B . C . D . E . F . G . H . I . K . L . M . N . O . P . Q . R . S . T . V . X . Y . Z .
R & A . D . T . V . Z .
Tab. II.
a . b . c . d . e . f . g . h . i . k . l . m . n . o . p . q . r . ſ . t . u . x . y . z .
Tab. III.
α . β . γ . δ . ε . ζ . η . ϑ . ι . κ . λ . μ . ν . ξ . ο . ϖ . ρ . σ . τ . υ . φ . χ . ψ . ω .
Y pro OY .
.R. .F. .Θ.
Tab. IV.
a . b . c . d . e . f . g . i . k . l . m . n . o . p . r . ſ . t . u .
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J. Nutting Sculp.

(Numb. 302.

PHILOSOPHICAL TRANSACTIONS.

For the Month of August, 1705.

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VII. *Au Extraordinary Caſe of a Coſtive Perſon, in a Letter from Mr* B. Sherman, *to Dr* Beeſton *of* Ipſwich; *with a Note on the ſame, by Mr* William Cowper, *F. R. S.*

I. *Mineralia quædam, Conchylia petrefacta, & alia Foſſilia è Berolina a Clariſſ.* Chriſtian. Maximiliano Spenero, *Doct. Med. Reg. Pruſſ. Aul. Acad.* S. R. I. *Cur. & Soc. Scient. Reg. Brandenburg. Colleg. ad Amicum ſuum Curioſiſſimum D.* Jacob. Petiver, *Pharmacop. Londin. &* Societ. *Reg.* Soc. *miſſa.*

1. MYtuli *Margaritifero* colore ſplendentes petrefacti, in quorum parte diverſa minutiſſimi *Turbines* petrefacti apparent: Ex tractu Moguntino *prope* Rhenum.

2. *Lapis* durus cinereus, cui minutiſſimi *Turbines* albicantes & *Cornu Hammonis minus* curioſè innati.

Non multum abhinc.

3. *Maſſa* ex meris *Turbinibus* minoribus conflata, qui deinde *Tartarea* cruſta inducti apparent.

Prope Moſellam *ex Electoratu* Trevirenſi.

4. Alia maſſa, colore rubiginoſo, ex *Pectinibus* minoribus conſtans.

Ex Moſella *prope* Confluentes.

5. *Maſſa Lapidea* ex varijs *Conchis* petrefactis conſtans, in qua *Cochleæ depreſſæ* veſtigia accuratè exhibentur.

Prope Francofurtum *ad* Mœnum.

6. Alia *Maſſa* ex varijs Conchis conflata, in qua præſertim *Cochleæ* petræfactæ, quarum in gremio *Hyacinthi minores creſcunt.*

Prope Moguntiam.

7. Hyacinthus quomodo in ijs locis in *Conchis petrefactis* vel ſupra illas naſcitur.

Ex ijſdem locis.

8. Maſſa ex *Bivalvibus*, *Mytulis* & alijs.

Inter *Moguntiam* & *Francofurtum.*

10. Alia admodum dura *Maſſa Turbinibus minutiſſimis* marmoreo colore ſplendentibus referta.

Supra Moguntiam.

11. Turbo minor ubique crenatus, in materia ſaxea repertus.

Non procul a Moguntia.

12. Concha bivalvis, Saxeæ duritiei.

In *Alpibus Helveticis* reperta.

13. Tellina petrefacta.

Ex Tractu Moguntino.

14. Cochlea petrefacta abſqueMatrice.

Ex eodem Tractu.

15. *Lapides* nonnulli *Entrochi.*

In *Ducatu Iſenacenſi* in *Thuringia* reperti.

16. Lapis cui a Natura Curioſa Figura inſculpta eſt. vide Icon. in GAZOPHYL. noſt. NATUR. & ART. Tab. 45. Fig 12.

Ex Moſella prope *Confluentes.*

17. Lapis Sciſſilis *Cupri* dives *Ichthyomorphus* in utroque latere.

Effoſſus in *Thyringia* ex fodina *Kupffer-Suhl* ditionis *Saxo-Iſenacenſis.*Habetur Icon in GAZOPHYL. noſt. NAT. & ART. Tab. 68. Fig. 2. & 3.

18. Lapis ex *Buccinulis candidis* in duram maſſam compactis, & *Tartarea* incruſtatione, veluti a Natura candiſatis conſtans.

Prope Francofurtum *ad* Mænum *invenitur.*

19. *Lithomarga* vel Terra *Sigillanda* Medicata, albis, flavis, & cæruleis ſtrijs diſtincta.

Ex Comitatu Jawerenſi *in* Bohemia.

20. Duo Paſtilli *Albo-cærulei*, ex eadem *Terra Sigillati.*

21. Duo Paſtilli rubicundi *Terræ Sigillatæ*, Ejuſdem Loci.

22. Lapis *Sciſſilis* figuris *Herbarum* ſignatus.

Ex Thyringia.

23. *Minera* Chalybis *Schmalkaldenſis* optima.

24. Alia ſimilis *Minera Chalybis* dives ex *Carinthia*.

25. *Minera* ex Monte Rammelsberg *Hercyniæ* prope *Goſlariam* Civitatem Imperialem, *Argentum*, *Cuprum*, *Plumbum*, *Vitriolum* & *Sulphur* continens.

26. Minera *Cobalti* ex Saxonicis fodinis, ex quibus fit color ille cæruleus, quem *Smaltam* vel *Cobolt* vocant.

27. *Quarzum* ex Metalli fodinis *Hercyniæ* metalli expers, varie vero variegatum.

28. Cochleæ duæ depreſſæ *Cornua Hammonis* ſimulantes ex Lacu non procul abhinc, aliàs in tota *Germania* non talis invenitur.

29. *Tophus* vel *Lapis Stillatitius* ex antro Baumanniano *Hercyniæ*, ubi multa curioſiſſima inveniuntur.

30. Muſcus *Topho* circumductus ex Fonte prope *Jenam* in *Thyringia* qui omnes in eum projectas res tali induit cruſta.

31. *Vitriolum* ex Auri fodinis *Hungariæ* dulce.

32. *Marcaſita* ſeu *Bismuthum*.

II. *De Piſcibus, Moluſcis & Cruſtaceis* Philippenſibus, *Ex MSS. R. P.* Geo. Joſ. Camelli *ad D.* Jacobum Petiver, *S. R. S. tranſmiſſis.*

1. B*angſi*, Hyſpanis *Volador*, eſt Milvus marinus. 2. *Baſac*, vel *Tambaſacan*, v. *Tambalo*, eſt piſciculus manatus amphibius, vivens mari & terra, in littore duabus quaſi manibus innixus diſcurrere ſolitus.

3. *Aſaaſa*, v. *Humahan*, v. *Quiquicbuaya* Byſaianis, *Parolog* Tagalis, *Dumdum* Catanduanis, eſt *Hypocampus* marinus. *An* ab hoc diſtinctus *Talli* ?

4. *Talli* Byſaianis, *Hypocampus* auriculatus, caput equinum, corpus coſtis compactum, caudâ lacerti.

5. *Hipou*, v. *Dilis*. Species *Squillæ marinæ minimæ*, v. *Formica marina.* Narrant tempore fœtationis in monſtroſæ magnitudinis glomum conglomerari, ita ut neſcio quale monſtrum mentiatur, & tandem circa littus diſſolvi. Eadem confirmat Fra. Ant. dela Zarza. *Vide D. Petiver.* GAZOPHYL. NATURÆ Tab. 43. fig. 13.

6. *Cohapo.* Piſcis merum venenum ſpinis viridibus, quarum ictus viperâ quâvis immedicabilior.

7. *Manala.* Piſcis Marinus, nocuus ſpecificè Morbo Gallico laborantibus.

8. *Calambutan*, Tagalis *Nooz.* eſt *Sepia*, Hiſp. *Xibia.* Os Sepiæ, Hiſp. *Choca*, duarum ſpithamarum & trium invenitur.

9. *Pagi* eſt *Paſtinaca* marina, Hyſp. *Raya.* Radio ſeu aculeo, Indis *Bunſul* gingivæ Scarificatæ in odontalgia dolorem tollit, ſed oportet ut radius vivo Piſce exemptus ſit. Hunc pulveratum cum *Elleboro albo* mixtum, facere dentes ſine dolore excidere ferunt.

10. *Piſcis Quadrangularis*, Orbibus annumerandus, Hyſp *Peje Caxon*, id eſt *Piſcis Ciſta*, Indis Boholanis *Tabalong*, Laytenſibus *Tabarong*, Tagalis *Botele cavan*, eſt ſpecies *Snottolfi* ſecundi *Geſneri*, deſcriptionem *vide* fol. 84, Iconem *Tab.* xxv. No. 7. apud *Iohnſtonium.* In Icone Pinna in fine ventris deſideratur, & angulorum proſtantia.

11. *Piſcis Quadrangularis alter*, ſeu *Minor*, Facie Tauri, Cluſio *Piſcis Triangularis*, Iohnſtonio *Piſcis Tauriformis*, Hyſp. *Peje Torete*, Indis *Botele Mayſungay*. Veſcus eſt ut prior. Cluſii *Triangularis*, collatus cum Luzonis *Quadrangulari minori*, idem eſſe videtur, ſed *Icon Cluſiani* nimiùm globoſa, cùm quem reſiccatum aſſervabam prolongatus ſit, & quandoque ſeſquipalmaris. Quare an idem ſit ignoro.

12. *Gadiamina*, Ballæna Ambravoma Joloanis.

13. *Tandayag*, & 14 *Tambohala*, Balænæ.

15. *Bujhaca* Maſſa eſt alba quaſi ſævacea, à Mari in littus ejecta, colligitur circa *Tayavas* & *Tal.* Illitam Bronchocelem diſſolvere tradunt. *An* Sperma Cœti *Officinarum ?*

16. Belà *Sinarum*, defertur ex *Canchinchina* ; ſunt autem panes 20 circiter librarum, candidi, ſævacei, ſolidiuſculi, lapidis ſpecularis ritu, quodammodo in bracteolas ſciſſilis, inſipidi, & ſævum olentis liquoris. Ad Tuſſes, & puerulorum diarrhæas commendant. *An* Sperma Cæti *Offic. ?*

17. *Puquitan*, *Polypus monſtroſus*, & tam exorbitantis magnitudinis, ut pedum quivis majorem adæquet Pinnum, quibus penè nullo negotio navim mergat. Latitat ad Inſulam *Iolo*, Batavis *Inſula Margaritifera*, in ſinu *Mindanai*, in ſinu *Sibuco*, in Freto *Sibuco*. An *Piſcis Remorans* Iohnſtonij, Nirembergij, Linſchotani ?

18. *Colaloca*, *Retiarius tremendus*. Inſultum facit in hujates Biremes, rete jactans, quo eas involvit, & demergit. *Indi* periculum eludunt objiciendo aparentiâ magna ex palmis compacta volumina, queis divertitur & illuditur.

19. *Lavinduyong*, *ſ. Tagan*, *Amamaſpas* Boholanis, ſeu *Gladius denticulatim aculeatus*, ſive *Priſtis* Rondeletij, eſt *Gladius* Iohnſtonij *primus*. Promuſcidem hujates contra fulmina valere volunt. Hyſp. *Peje Sierra* & *Peje Eſpada*. Abundat in lacu *Bay*: Pinguedo lampadibus deſervit.

20. *Quataffi Marianorum*; Hyſpanis *Peje Eſpada*, eſt *Gladius* Iohnſtonij *ſecundus*, promuſcide lævi. Aliis *Bacangan*.

21. *Pexe Lanza*, ſeu *Piſcis Lancea*, corpore eſt ſuppari Tonninæ, ſeu Delphini. Caput porcinum promuſcidis loco longâ, & ut coreum *Rayæ*, aſperâ armatum lanceâ. Alæ membranaceæ ut *Veſpertilionis*, longitudinis ipſius corporis, latitudinis quandoque orgyialis, quibus velociſſimè biremes inſequitur, & non nunquam navis puppi lanceam infigit, aut etiam magis audaculos piſcatores transfodit.

22. *Duyong* Indorum, *Peje mulier* Hyſpanorum, *Haybe* Sinarum, eſt *Manatus* Cluſii, & aliorum. Icon Piſcis Anthropomorphos *Iohnſtronij* ex *Kircherio* ſpuria eſt, & adinventa. Dentes & Coſtæ medicum in uſum veniunt: Attamen oſſicula ex capite circa aures efficatiora ſunt. Ex his ſphærulæ & monilia fiunt, in Rheumate, Catharro, diſtillatione, defluxione, & ſanguinis profluvio quocunque parti contrariæ applicanda. Probantur ſi ſanguis ex inciſa vena effluens, ſine morâ admotis ſiſtatur. Raſuram crudam in dyſſenteria, & febribus commendant; Suffumigium ex ea teneſmo. *Schroderus* uſta laudat in renum & veſicæ calculo, dolore nephritico, & colicâ, alij in gingivis eroſis pro dentifrico. *Dentes* appliciti in arteria Pollicis reciſſa, illico ſanguinem ſtiterunt Joſepho Hernandez puero. Umbilico impoſiti mulieri, quæ 18 dierum copioſiſſime fluxu lochiorum exhauſta erat, feliciter fluxum retardârunt. Indo è contra narium critica hæmorrhagia debilitato, quoties corpori applicati fuêre, toties fluxum vehementer auxerunt.

23. *Pogapo* Byſaianis, Leytentibus *Mogapo*, Piſcis eſt formæ Tiburonis, c. major bicubitalis, coloris nigro-morelli. Caput magnitudinis quartæ partis ſui corporis, Fauces magnæ, corpus parum ſquamoſum; veſcus eſt.

24. Remora ſeu Echeneis, *Indis* Boholanis & Zebuanis *Comi*, Leytenſibus *Quini*. An Braſilienſium *ſperuquiba*? Ordinariè piſcibus majoribus, & navibus inhæret, quas in curſu impedit, & retardat, quamvis non eâ violentia, qua paſſim, & vulgò narratur. Longitudinis eſt ſpithameæ, & ultrà, coloris ex albido fuſci, ſubviolaceè relucens. Capite ſupino acetabula habet fimbreata, ceu cirrata, tranſverſaliter poſita, ut ſtrigilis denticulatæ ſeries, quibus pertinaciſſimè hæret, ita ut omni conatu trahendo, citiùs corpus, relicto capite, detrahatur; antequam caput disjungatur, ſi verò corpus caput verſûs adigas facilè diſunitur, & ſeparatur à re cui inhæſitat. vid. GAZ. NATUR. Tab .44. fig. 12.

25. *Bangol*, Piſcis *Catanduanus*, totus intra & extra ruberrimus, ſquamarum loco ſubverrucoſus ut *Raya*, alatus ut *Hirundo*, alæ ſtriatim pictæ ut *Tinunculi*, ſeſquiſpithameus, venenatus & non edulis. Suſpendunt eum caudâ, branchijs infixo *Stylo*, & ita per noctem, omnis ejus caro, remanente tantummodo ſpinâ in ſanguinem reſolvitur, quem manè ex ſuppoſitis vaſculis colligunt, & tincturis deſtinant; eo infecta coloris Laccæ ſunt, floridæ, & conſtantis. Vide Fig. in GAZOPH. NATUR. Tab. 30. fig. 2. *D. Petever.*

26. *Piſciculus Tampal*, ſeu *Daledale*. Seſquipalmam longus, biunciam latus, planus eſt ut compreſſus, pronè argenteus, ſupinè terreus, Squammulæ crebræ, ſpinâ majori tantùm donatus, edulis. Vid. Fig. in GAZOPH. NATUR. Tab. 26. fig. 10. *Jac. Peitver.*

27. *Bigo*, Sanguiſuga marina, piſcis. Piſciculus eſt tenuiſſimus, vix ſeſquiuncialis; applicitus ſine morâ ſanguinis filum educit, nec dolorem, inflammationem, aut tumorem inducit, aut cauſat.

2.8 *Comondajba* Byſaianis. ſpecies eſt Locuſtæ marinæ, ſive *Tamara-guacu* Braſilianorum *Iohnſtonij*, ſeu *Hippocampus Locuſtæ Mar. Spec.* Matthiol. Quem integrum vidi, formæ & magnitudinis erat, quâ à *Matthioli* depingitur. Aſſervo & alterius forfices, quarum unus ſolus articulus, digitum Indicem longus eſt. N. B. Longiuſculè denticulatæ, falces brachiis inſeruntur foraminulatis, cultelli complicatilis in modum reflexæ.

29. *Olang.* Locuſta marina major.

30. *Colagia.* Locuſta marina minor.

In Provincia *Pangaſinan*, circa Metropolim *Lingayen*, ex fluvio arbores conſcendere narrant, Animalia ſpithamâ longiora equo phalerato ſimilia. *Berd. Caraſco.* *An* Species *Locuſtæ fluviatilis ?*

31. *Manla* Boholanis, Zebuanis & Panayenſibus, *Tila* Leytenſibus, ſpecies eſt ſquillæ marinæ, quandoq; longitudinis bicubitalis.

32. *Banagan.* Species eſt *Aſtaci marini*, cornuti, echinati, paleari, luteo, & cinabarino variè & elegantiſſimè picturati. Vid. in GAZOPH. NATUR. *Jac. Petiver.* Tab. 29. fig. 7.

33. *Talangca.* Aſtacus lacuſtris magnus.

34. *Catung.* Aſtacus fluviatilis parvus.

35. *Bungcan,* Cancellus parvus, vix uncialis, veſcus, gaudens æſtuariis, pulcherrimè omnibus coloribus variegatus. Forficula una puſilla, altera corpore quadruplo majore.

36. *Alimango.* Cancer marinus major.

37 *Alimaſag.* Cancer marinus minor.

38. *Cancellum terreſtrem,* hirſutum, qui gaudet *Palmetis Cocco-Nuciferis*, commendunt ut ſummopere proficuum diarrhæa laborantibus.

39. *Mentula marina,* Indis *Balat,* eſt *Zoophytum* marinum veſcum, formæ tubæ, bivalvis. *Sinæ* illud pluris æſtimant, quàm *Tragacanthum Indicum Venereum,* ſeu Nidos avium *Salgan,* & ad eadem commendant.

40. *Timpalan,* Zoophytum *marinum,* ſpecies *Spongiæ,* vide in ſupplemento in *Hiſt. Plant.* Joan. Raij *lib.* 1. fol. 77. titulo *Plantæ marinæ ſaxatiles, & Zoophyta.*

III. *Epiſtola*

III. *Epiſtola Viri Reverendi D.* Georgij Hickes, *S.T.P. ad D.* Hans Sloane, *M. D. & S. R. Secr. De varia lectione inſcriptionis, quæ in ſtatua* TAGIS *exaratur, per quatuor Alphabeta* Hetruſca.

Georgius Hickes Hanſo Sloan S. P. D.

PErluſtravi, Vir Clariſſime, quam deſcriptam ad Societatem Regiam perferendam dederunt D. D. *Spanhemius* & *Geoffroy*, Iconem unà cum D. *Boivini* diſſertatione de eâ Gallicè Scriptâ, in qua TAGIS eſſe juvenili ſpecie imaginem iſtam, quæ ad te nuper à *Lutetiâ Pariſiorum* miſſa eſt, multis argumentis contendit. Verùm ſive TAGES apud Hetruſcos Auruſpicinæ auctor, ſive gladiator ſive forte qui à Ludis publicis Lauream reportaverit, ſive denique quis alius ſit, quem Icon illa adumbrat, ea, quæ femini ejus, crurique ſiniſtro Characteribus Hetruſcis inſcribuntur, pro *Alphabetis* linguæ Hetruſcæ, quæ docti nobis dederunt, aut dediſſe ſperarunt, alio alioque modo per literas Romanas Græcaſq; eatenus facilè deſcribi poſſunt, quatenus Scriptionis Characteres integri, & illæſi in eis ſuperſunt. Alphabeta verò, quibus utimur in iis legendis quatuor ſunt: Scilicet Patris *Franciſci Giambullari* unum, alterum Anonymi Deſcriptoris, tertium *Jani Gruteri*, & quartum *Andreæ Brogiotti F.*

Primum, in quo Characterum Hetruſcorum figuras, & poteſtates expreſſit * *Franciſcus Giambullari*, extat in egregio ſuo libello de Origine Linguæ Fiorentinæ Italicè Scripto, cui titulus hic eſt. *Origine della Lingua* Florentina. *altrimenti* IL GELLO DI M. PIER. FRANCESCO GIAMBULLARI

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* *vide hujus viri Eulogium in prefatione generali* Geogij Hickeſij *ad Antiquæ Literaturæ Septentrionalis duos libros nuper* Oxoniæ *à ſe Editos* p. iv. *&* xxiv.

LARI *Academico Fiorentino.* in FIORENZA. M.D.XLIX. In aurei hujus libelli pag. 97. characterum Hetruſcorum figuræ, quas à dextra verſus ſiniſtram pictas dicit, cum eorum poteſtatibus per literas Romanas expreſſis delineantur ut in Tab. I.

In ſecundo, quod invenire eſt inter monumenta Hetruſca, quæ ad veſtram Societatem miſit immortalis memoriæ *R. Fabrettus*, Hetruſcorum characterum figuræ, &, poteſtates ab Anonymo eo modo quo in Tab. II. deſcribuntur

In tertio, *Janus Gruterus* libri ſui *vett.* Inſcriptionum pag. CLXV. tabularum *Eugubinarum* characteres Hetruſcos cum eorum poteſtatibus per Græcas literas deſignatis, ut eas ipſe animo finxit, exhibet ; quas videas in Tab. III.

In quarto autem, quod *Andreas Brogiottus F.* delineavit in libro ſuo, qui inſcribitur INDICE DE CARATTERI *con l'inventori & Nomi di eſſi eſiſtenti* NELLA STAMPA VATICANA & CAMERALE. in ROMA. M.DC.XXVIII. Hetruſci Characteres ſeptem tabularum ænearum, quæ *Eugubij* jam pridem repertæ erant, longe aliter ac apud *Gruterum*, &, me judice, multo etiam verius, cum valore ſuo per literas Romanas denotato, exprimuntur, ut in Tab. IV.

Juxta primum Alphabetorum, quæ in tabulis exhibentur, uno atque altero Charactere etiam ex ſecundo in ſubſidium evocatis, inſcriptionis Hetruſcæ, quæ in ſiniſtro femine, crureq; cernitur Ectypi tui TAGIS à dextra ſiniſtram verſus, lectio hæc eſſe videtur :

MI. GLEDEM: STULPOE: ADI [a]∴ IMI
GASSI : D [b]∴ GD [c]∴ II. XD. CECLES : CEVA :

Juxta autem iſtud *Jani Gruteri*, quod tertium eſt ordine Alphabetum, ſic legenda eſt inſcriptio,

μι : ωζεδεμ. υλκζαωε: αοιλεμι
ακυ . . ι: ο. [d]∴ ωο ..[e].. χο. ωεπζεν : πο [f]∴ α :

[a] forte K.
[b] forte A.
[c] forte V.
[d] forte N.
[e] forte MI.
[f] forte T Z.

Verùm ſecundum ultimum, quod delineavit *Andreas Brogiottus F.* ſic deſcribenda eſſe videtur.

MI. GLEDEM : [g]⁚ RULAGE : ADIFIMI
GA: . [h]⁚ I : D, ... G G ... XD. CECLEN : CETA :

Habes jam, Doctiſſime *Sloani*, quæ cùm rerum occultarum ſtudioſis communicata, illos forſan ad penitiorem inſcriptionum Hetruſcarum diſquiſitionem excitent, quæ diu jam exercuerunt, dicam an potius torſerunt doctorum ingenia, & dignæ plane ſunt, ad quas non legendas tantum, ſed perfectè explicandas aſſurgat aliquis Oedipus, ipſo *Tage* divinior Vates, & arcanarum rerum longe certius, & multo magis fidum Oraculum. Aliquid in Hetruſcis enucleandis ante octoginta annos non ſine laude tentavit *Adrianus Scrieckius* in libro ſuo Belgicè Scripto. cui tamen Epigraphe Latina hæc eſt : *Adriani Scrieckij Rodorni Originum rerumq; Celticarum & Belgicarum libri XXIII.* In lib. I. pag. 32, 33, &c. Inſcriptionem Hetruſcam, quæ ſibi, dum in Academia Pariſienſi juvenis ageret, data fuit ab *Errico Memmio*, non deſcribendam ſolum ſuſcepit, ſed in aliquibus *Belgice* explicandam. Quod ſi integram eam inſcriptionem quemadmodum aliquas ejus portiunculas explicatu viſus eſt per *Belgicam* ſuam recte enucleaſſet *Scrieckius*, tunc non tantum *Hetruſca* lingua, unde nata, & diſcenda eſſet, nempe ex Belgicæ matrice, veteri Theotiſca, verum etiam *tabb. Eugubinæ*, quo pacto optime explicari poſſent, extra inde controverſiam doctis conſtitiſſet. Earum etiam pars illa ſunt, quæ deſcripſit, & in libro ſuo vett. inſcriptionum publicavit *Gruterus*. Deniq; tabulæ illæ, quas Societati Regiæ moribundus legaſſe *Fabrettus*, earum ectypæ eſſe videntur, quas vir ille, maximus antiquarum rerum indigator, ex tabulis exemplaribus perquam accurate ſuum in uſum exprimendas curaverat. Porro tabularum, quas (ut videtur) expreſſas habet Societas veſtra Regia, una, eaque omnium maximè ſpectabilis, (demptis ſeu deſcriptoris, ſeu Typographi erroribus) eadem

[g] *forte* Z.

[h] *forte* Z Z.

prorſus eſt cum illa, quam in paucis ſuopte ingenio, ſuoque pacto aperire tentavit *Adrianus Scrieckius*, qui integræ interpretationi ſe non deeſſe, deo volente, declarabat. Verùm quamvis olim *Scrieckius*, & nuperrime *Scrieckio* in antiqua literatura multo major tuus *Fabrettus*, qui *tabb. Eugubinas* explicare tantopere voluerunt, ſucceſſum, quem optabant, non habuere, ſperandum tamen eſt, *Doctiſſime Sloani*, ex venerandæ antiquitatis cultoribus D. Opt. Max. tandem aliquando aliquem, ſive Ciſalpinum, ſive Tranſalpinum, ſuſcitaturum, in quo Spiritus ille, & ingenium *Fabretti*, duplex forſan erit, quibus non tantum *Eugubinas* illas ſeptem *tabb.* quæ doctorum quaſi opprobria tam diu extitere, ſed *Volatterenſes* illas, quas *Giumbullari* memorat, p. 96. & Hetruſcarum inſuper inſcriptionum quicquid uſpiam ſive in tabulis, ſive in ſtatuis curioſos excruciat, poterit aperire. Certe gnaro viro, qui *Hetruſcis* antiqnitatibus operam, & ſtudium navaverit pro gentilitio ſuo in bonas literas amore, non poteſt non eſſe, & adeſſe ſummus Fautor Celſiſſimus ille princeps, & Auguſtiſſimæ MEDICEÆ Gentis gloria, COSMUS III. Magnus *Hetruriæ* Dux, patronus doctorum longe ampliſſimus, & quaqua patet, aut patebit Orbis literarius, maxime ſemper celebrandus. Sperandum (inquam) eſt φιλαρχαίοις omnibus, iiſque vehementer optandum, ut ſub tantis auſpicijs aliquis é divini ingenij hominibus ad *Hetruſcas* inſcriptiones, tum quæ in tabulis, tum quæ in ſtatuis exarantur, feliciter explicandas, Deo tandem excitante, adſurgat. Statuas enim extare, perinde ac tabulas, literis Hetruſcis inſcriptas non ſolum oſtendit Ectypi veſtri Prototypus ubi ubi ſit, multæque id genus, imagines quas *Fabrettus* cum tabulis ſuis ad *Soc. Regiam* mittendas curavit, ſed id maxime quod ſcribit toties in ſuperioribus citatus *Giambullarius*, præſertim libri ſui p. 96. his in verbis: *Nel.* 1507. *il di xxix di Gennaio, vicino ad un Caſtello del contado noſtro, detto la Caſtellina divellendos una vigna, fù ſcoperta una ſtanza tutta ſottera, lungà braccia xx. alta cinque, & larga tre, con alcuni riſalti da canto ; dove ſi trovarono ſtatue, ceneri, ornamenti,*

& lettere Etruſche. Delle quali vi moſtrero io la copia à voſtro piacere, come à me la moſtrò & diede il dottiſſimo & parimente umaniſſimo Piero Vettori noſtro, diligentiſſimo inveſtigatore delle coſe antiche ; inſieme con lo Alfabeto Etruſco, che all'ora non era fuori. De ſtatuis iſtis tranſcripta hæc eſſe volui, tum ut, me Auctore, inquirere non tardares, quorum forte in porticibus, aliiſve in locis admirandæ etiam nunc ſtant, tum præcipue ut ſcires, an forte Iconum, quas jam in magno ſatis numero poſſidet *R. Soc.* prototypi, capita ſua veneranda inter illas tollant. De hac re doctos quibuſcum per Italiam literarum commercium habes, ſpeciatim *Hetruſcos* & Umbros facile poteris percontari. Ex quibus, ſi quæ expectationi noſtræ reſpondeant acceperis, fac quæſo, ut ea quam primum cognoſcam. *Vale*, Vir optime, ac eruditiſſime, & redamare perge integerrimum tui cultorem *Hickeſium*. Faxit Deus, ut diutiſſime vivas doctorum omnium deliciæ, & bonarum literarum, is qui es, maximus ſemper adjutor, & patronus. Iterum *vale*.

IV. *The Theory of Muſick reduced to Arithmetical and Geometrical Proportions, by the Reverend Mr* Tho. Salmon.

SIR,

Having had the honour laſt week of making the trial of a Muſical experiment before the Society at *Greſham College*, it may be neceſſary to give a farther account of it ; that the Theory of Muſick, which is but little known in this Age, and the practice of it, which is arriv'd at a very great excellency, may be fixed upon the ſure foundations of Mathematical certainty. The Propoſitions, upon which the Experiment was admitted, were : That Muſick conſiſt-

ed in Proportions, and the more exact the Proportions, the better the Muſick: That the Proportions offer'd were the ſame that the ancient *Grecians* us'd: That the Series of Notes and Half Notes was the ſame our Modern Muſick aim'd at: which was there exhibited upon finger-boards calculated in Mathematical proportion. This was demonſtrated upon a Viol, becauſe the Strings were of the greateſt length, and the proportions more eaſily diſcern'd; but may be accommodated to any Inſtrument, by ſuch mechanical contrivances as ſhall render thoſe ſounds, which the Muſick requires.

To prove the foregoing Propoſitions, two Viols were Mathematically ſet out, with a particular Fret for each String, that every Stop might be in a perfect exactneſs: Upon theſe, a Sonata was perform'd by thoſe two moſt eminent Violiſts, Mr *Frederick* and Mr *Chriſtian Stefkins*, Servants to her Majeſty; whereby it appear'd, that the Theory was certain, ſince all the Stops were owned by them, to be perfect. And that they might be prov'd agreeable to what the beſt Ear and the beſt Hand performs in Modern practice, the famous *Italian*, Signior *Gaſperini*, plaid another Sonata upon the Violin in Conſort with them, wherein the moſt compleat Harmony was heard.

The full knowledge and proof of this Experiment may be found in the two following Schemes, wherein Muſick is ſet forth, firſt Arithmetically and then Geometrically: The Mathematician may, by caſting up the proportions, be ſatisfied, that the five ſorts of Half-Notes here ſet down, do exactly conſtitute all thoſe intervals, of which our Muſick does conſiſt. And afterwards he may ſee them ſet forth upon a Monochord, where the meaſure of all the Notes and Half-Notes comes exactly to the middle of the String. The Learned will find that theſe are the very proportions which the old *Greek* Authors have left us in their Writings, and the Practical Muſician will teſtifie, that theſe are the beſt Notes he ever heard.

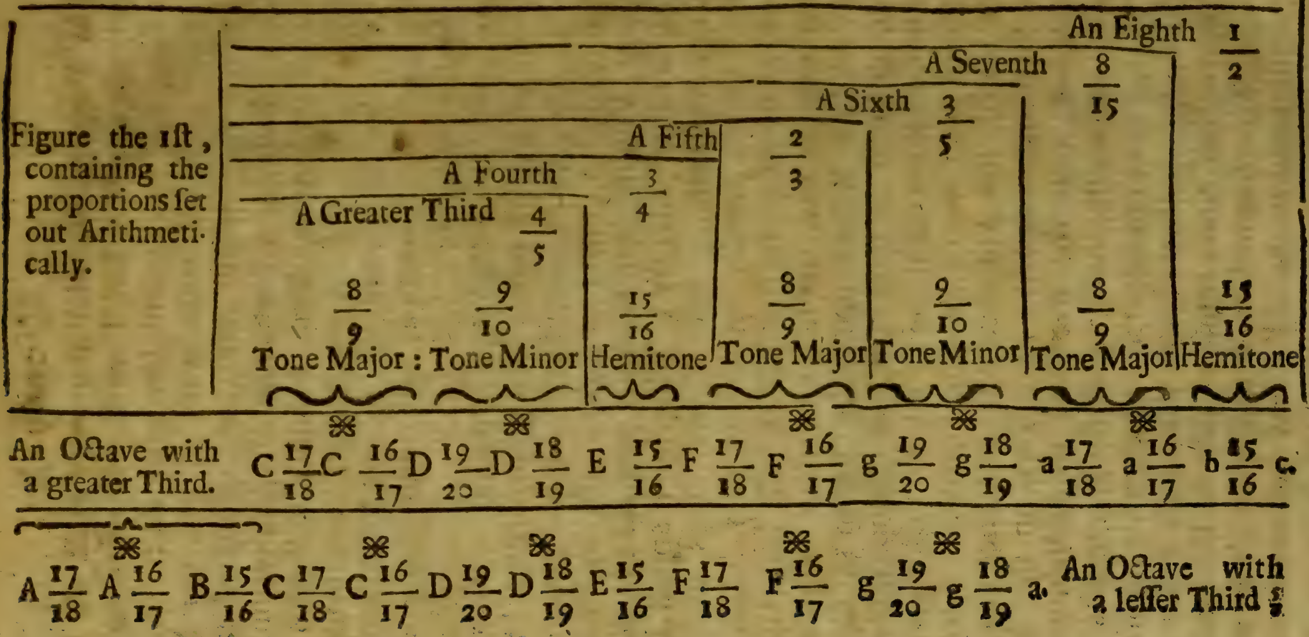


Figure the 1ſt, containing the proportions ſet out Arithmetically.
An Eighth 1/2
A Seventh 8/15
A Sixth 3/5
A Fifth 2/3
A Fourth 3/4
A Greater Third 4/5
8/9 Tone Major : 9/10 Tone Minor
15/16 Hemitone
8/9 Tone Major
9/10 Tone Minor
8/9 Tone Major
15/16 Hemitone
An Octave with a greater Third.
C 17/18 C 16/17 D 19/20 D 18/19 E 15/16 F 17/18 F 16/17 g 19/20 g 18/19 a 17/18 a 16/17 b 15/16 c.
A 17/18 A 16/17 B 15/16 C 17/18 C 16/17 D 19/20 D 18/19 E 15/16 F 17/18 F 16/17 g 19/20 g 18/19 a.
An Octave with a leſſer Third.

The Explication of the firſt Figure.

Between the two loweſt Lines, you have the Series of all the 12 half Notes in an Octave, from Are to Alamire, which added together make an Octave or exact Duple Proportion: The ſeveral parts alſo added together make all thoſe intervals of which it is conſtituted. As for example, the two half Notes from A to A ※ $\frac{17}{18}$, and from A ※ to B $\frac{6}{17}$ make a Major Tone $\frac{8}{9}$; to which if an Hemitone from B to C $\frac{15}{16}$ be added, you have a leſſer Third $\frac{5}{6}$.

In like manner between the two next lines, you have the ſeries of all the 12 half Notes, in an Octave from C fa ut to C ſol fa ut: the two firſt Tones added together make a greater Third: and ſo you may add a Tone or Hemitone till you arrive at every interval in the Octave, which ſo call'd becauſe eight ſounds are required for expreſſing thoſe ſeven gradual ſteps whereby we commonly aſcend to it.

It may be alſo obſerv'd, that the proportions falling upon the ſame Notes in two Keys, one finger-board will be ſufficient for both.

TIs acknowledg'd by all that are acquainted either with Speculative or Practical Muſick, that every interval is divided into two parts, whereof one is greater than the other: An Eighth $\frac{1}{2}$ into a Fifth $\frac{2}{3}$ and a Fourth $\frac{}{4}$. Again, a Fifth $\frac{2}{3}$ into a greater Third $\frac{4}{5}$ and a leſſer Third $\frac{5}{6}$. Thus alſo a greater Third $\frac{4}{5}$ muſt be divided into a Tone Major $\frac{8}{9}$ and a Tone Minor $\frac{9}{10}$. The Leſſer Third (to comply with the practice of Muſick) is rather compounded of. than divided into a Tone Major $\frac{8}{9}$ and an Hemitone, which is its complement, $\frac{15}{16}$.

Three Tones Major, two Tones Minor, and two of the foreſaid Hemitones, placed in the order found in the Scheme, exactly conſtitute the practical Octave; which is ſo call'd becauſe it conſiſts of eight ſounds, that contain the ſeven gradual intervals. But it is alſo neceſſary to ſet down the Diviſions of the whole Tones, which are the true Chromatick half Notes, becauſe there is great uſe of them in Practical Muſick.

To make all our whole Notes, and all our half Notes of an equal ſize, by falſifying the proportions, and bearing with their imperfections, as the common practice is, may be allow'd by ſuch Ears as are vitiated by long cuſtome: But it certainly deprives us of that ſatisfactory pleaſure which ariſes from the exactneſs of ſonorous numbers; which we ſhould enjoy, if all the Notes were truly given according to the Proportions here aſſign'd.

It is very eaſie to ſatisfie our ſelves in the Arithmetical Scheme, by thoſe operations which *Gaſſendus* has ſet down in his Manuduction to the Theory of Muſick, Tom. V. pag. 635. As for example, his rule for Addition is, That two Proportions being given, if the Greater number of one be multiplied by the Greater number of the other, and the Leſſer by the Leſſer, the two numbers produc'd exhibit the compounded Proportions. Thus take a Practical Fifth $\frac{2}{3}$ and a Practical Fourth $\frac{3}{4}$ for the two Proportions given, multiply 3 by 4 and you have 12, then multiply 2 by 3 and you have 6: which compounded proportion of 12 to 6 makes the Practical Octave $\frac{1}{2}$.

Thus, according to his Arithmetical operations of Addition, Subſtraction, Multiplication or Continuation, and Diviſion, is our whole Syſtem proved, which for the more eaſie application to Practical Muſick, ſhall be alſo ſet forth Geometrically upon the 6 ſtrings of a Viol. *See Figure the 2d.*

The

This Mathematical fixing of the Frets enables every Practitioner, who ſtops cloſe to them, to give the Proportions of the Notes in a greater exactneſs, than can be done upon the Baſs-Violin or Violin itſelf: ſince they may be ſet forth more perfectly by a pair of Compaſſes dividing a line, than the niceſt Ear can direct.

Though the Frets for the ſeveral Strings do not ſtand in a ſtrait line, and the places are alſo ſhifted in different Keys, yet the Ear naturally directs the Fingers to them: inſomuch that thoſe perſons, who have all their lives time been accuſtom'd to ſtop upon Frets that go quite croſs the Finger-boards of their Inſtruments, do with very little practice fall right upon theſe. Such is the power of a Muſical Genius, as may be undeniably proved by thoſe that play upon the Violin; who, when they change the Key, fall upon the right Stops, tho' they have no viſible direction where to ſtop, nor time to alter, by the Ear, the Note they firſt pitched upon.

By this Standard of Regular Proportions may the Voice be formed to ſing the pureſt Notes; they are all the ſame in Vocal and Inſtrumental Muſick; if then the Inſtrument which governs the Voice be perfect, the Ear will of neceſſity bring it to perfection. It is a great pity that a good natural Voice ſhould be taught to ſing out of Tune, as it muſt do, if it be guided by an imperfect Inſtrument; and this may be the reaſon why ſo few attain to that melody, which is ſo much valued; but ſince we now know wherein perfection lies, a conſtant practice will come to the attainment of it. The dividing Wholes into Chromatick Hemitones is very neceſſary, but very difficult for the Voice to be broken to: If it learns from an Inſtrument whoſe whole Notes and whoſe half Notes are ſuppoſed to be equal, the ſound muſt needs be very uncertain and unharmonical; whereas the proportions truly fixed, would bring it to a perfection in the niceſt and moſt charming part of Muſick.

The Chromatick Hemitones are the ſmalleſt Intervals our Modern Muſick aims at, tho' the Ancients had their Enharmonick quarter Notes, which they eſteem'd their greateſt excellency: Theſe may alſo in time be recover'd, ſince we know their proportions; for as the Diatonick Tone is divided into Chromatick Hemitones, ſo after the ſame manner may the Chromatick Hemitones be divided into thoſe leaſt Enharmonick Intervals, which were ever made uſe of.

But if we go no further, yet this Experiment demonſtrates the true Theory of Muſick, and brings the practice of it to the greateſt perfection.

V. *Part of a Letter from the late* Sir Philip Skippon, *Kt, to the late Reverend Mr* John Ray, *concerning the Bones of a* Humane Fœtus *voided thro' an Impoſtume in the Groin. Communicated to the Publiſher, by Mr* Samuel Dale.

London, January 22. 1662.

YEſterday in the Afternnon my Cozen *Horſnel* and my ſelf viſited a Woman 66 years old, in *Drury-lane*, who had a Child conſumed in her *Uterus* about 28 years ago; She bore two Children after this, one lived 11 years, and the other 6. About 8 years ago an *Impoſtume* broke out in the Right *Inguen*, and then ſeveral Bones of a Dead Child were expell'd, (ſome of them I have by me.) She hath a great Swelling now in that *Groin* where ſhe feels ſomewhat very hard, which ſhe ſuſpects are Bones, I took a particular account of all Circumſtances; but this is proportionable to the narrow extent of a Letter, and indeed is the ſubſtance of all.

VI. *An Abſtract of a Book, Entituled,* NEKPOKHΔEIA: *Or, The Art of* Embalming; *wherein is ſhewn the Right of Burial and Funeral Ceremonies, eſpecially that of Preſerving Bodies after the* Egyptian *Method. Together with an Account of the* Egyptian *Mummies, Pyramids, Subterranean Vaults and Lamps, and their Opinion of the* Metempſychoſis, *the Cauſe of their* Embalming: *As alſo a Geographical deſcription of* Egypt, *the Riſe and Courſe of the* Nile, *the Temper, Conſtitution and Phyſick of the Inhabitants; their Inventions, Arts, Sciences, Stupendious Works and Sepulchres, and other curious Obſervations any ways relating to the Phyſiology and Knowledge of this* Art. *Part I. Illuſtrated with a Map and fourteen Sculptures. By* Tho. Greenhill, *Surgeon. In* 4*to.* London, 1705.

IN conſidering the great Incroachments and daily Abuſes of the *Undertakers* by practiſing the *Balſamic* Art, as alſo how little had been wrote on that ſubject, the *Author* was willing to vindicate the Honour of his Company, and to retrieve the Practice of ſo ancient, ſo uſeful, and ſo noble an Art as that of *Embalming*: He was therefore deſirous that ſome Ingenious and Learned Perſon, throughly qualify'd by the Knowledge and Practice of the ſeveral Branches of *Phyſick*, might have undertaken this Work; but meeting with none that would give themſelves ſo much trouble, he thought it better to exert his ſmall Talent, than that the *Balſamic* Art, which bears ſo conſiderable a Figure in *Surgery*, as well as other *Sciences*, ſhould be neglected and paſſed by as a matter not worth taking notice of. A farther motive to his Undertaking was, that he hoped by ſubmitting with the greateſt modeſty and humility to the Learned World, they would excuſe all faults, by reaſon, it is not ſo much to be found fault with, if in attempting to find out an unbeaten Path, one often miſtake ones way.

To this end therefore he applys himſelf, by way of Letter, to three Perſons, who for their skill in Hiſtory, Antiquities and Languages; their knowledge of Books, Manuſcripts, or Things themſelves, as well as their Experience and Practice in *Phyſick* and *Surgery*, evidently appear to be proper Judges of this matter.

The firſt Letter is addreſſed to *Charles Bernard*, *Eſq*; Serjeant-Surgeon to her *Majeſty*; at that time Maſter of the Surgeons Company, and one of the Surgeons of St *Bartholomew*'s Hoſpital.

In this Letter the *Author* ſhews the Excellency of *Surgery*, and that *Anatomy* and *Embalming* are Branches thereof, and equally to be eſteem'd; the one informing us of the conſtituent Parts of the Body, and the other preſerving them freſh in our Sights and Memories: That *Embalming* is no leſs ancient and noble than *Surgery* itſelf, whence he infers the Authority and Reaſonableneſs of its Uſe: That the *Naturaliſts*, the *Phyſician*, the *Surgeon*, and the *Anatomiſt* reap great advantages in the way of Knowledge, from the preſervation of Animals and other Rarities. The *Naturaliſt* makes uſe of it in collecting and preſerving a numberleſs variety of Things in the Animal and Vegetable World. The *Phyſician*, in preſerving the Juices of the Body from Malignant and Putrid Feavers. It teaches the *Surgeon* the Art of Bandage or Rouling; as alſo to know what Remedies are proper againſt Mortifications, *&c.*

It teaches both the *Phyſician* and *Surgeon* (by *Anatomy*) the ſituation and parts of a Man's Body, and to prepare true and natural Schemes of the Veins, Arteries, Nerves, *&c.* Then he obſerves, that without the *Balſamic* Art *Anatomy* is deficient; inaſmuch as it can neither ſo particularly, nor frequently ſhow us, what in conjunction with it, may be, without any offence, contemplated at any time, and as often as we pleaſe; ſo that the preſent Age accounts the chief uſe of this Art to be in *Anatomical* Preparations, as alſo that the Knowledge of it may be neceſſary in our Domeſtic and Culinary Affairs; ſuch as conſerving all ſorts of Roots, Herbs and Fruits; preſerving Wines, Fruits, Fleſh, Fiſh, *&c.* But the more antient, more general, and more proper uſe of *Embalming* lies in preſerving a Human Dead Body intire; more Ancient, as having been deviſed by the Wiſe and Learned *Egyptians*, and more general, in that it relates to every particular Perſon; which nevertheleſs being looked upon as an unneceſſary expenſive trouble, was another reaſon for him to aſſert, that *Embalming* was a particular part of that Duty, which obliges all Mankind to take care of their Dead. In order to this, he firſt gives us ſome cogent Reaſons to prove the Right of Burial, what things are neceſſary thereto, whether Ceremonies are needleſs and Superſtitious, or Monuments Vainglorious, and this he lays down according as Nature dictates, the Law of *God* appoints, and the Law of Nations directs and obliges. Then he ſhews the want of Burial to be a Puniſhment and Curſe, and that even the particular Ceremonies of Funerals are not to be neglected; yet withal cautions his Reader to avoid the miſtake of thinking the want of it, or any particular Ceremony thereof, may be any ways prejudicial to a Chriſtian Soul, or any occaſion of the deficiency of the leaſt part of the Body at the Reſurrection, and only ſhows the Infamy and Diſgrace of a Body being denied Burial; and how far, wherefore and to what end the following cuſtoms are to be made uſe of;

ſuch as *Kiſſing* the Dead, *Cloſing* their Eyes, *Conclamation*, *Sounding* Brazen Veſſels, *Waſhing*, *Anointing* or *Embalming* the Dead, *Adorning*, *Dreſſing* and *Crowning* the Corps, *Laying* it out, *Carrying* it forth, the *Funeral Proceſſion*, *Burning* or *Burying* the Corps, the manner of *Mourning*, and in ſhort, many things relating to the fore and after part of the *Funeral* Duty; giving a great variety of pertinent Quotations out of Ancient Authors, intermixed with good conjectures of what inducements the Ancients were influenc'd by, in falling into and adhering to their various and reſpective Cuſtoms: But his main View is to ſhow how far theſe *Funeral* Rites and Ceremonies are uſeful and allowable, when accompanied with the Art of *Embalming*; and on the contrary, how vain and ridiculous they are when uſed without it; eſpecially if they do but in the leaſt exceed the bounds of Modeſty and Frugality. And thus having ſhewn, as aforeſaid, how and when *Funeral* Ceremonies are uſeful, as alſo that they are inſignificant without *Embalming*; he tells you moreover, " That care is due ' to the Body, tho' Lifeleſs, upon the conſideration, that ' the Soul, in a ſeparate ſtate, longs for Re-union, and ' wiſhes her Dead Companion to ſhare in her then preſent ' felicity, by virtue of eternizing Monuments. He ſets ' forth, that *Embalming* is the beſt and moſt lively way of ' preſerving the memory of deceaſed Friends, by giving a ' real Preſence, inſtead of faint and ſhadowy Repreſenta- ' tions, and brings abundance of *Theological*, *Phyſical* and ' *Political* Arguments, in vindication of the Art of *Embalming*; but not having room to inſert them, we will only mention two or three of the latter.

' Firſt, If we take it in a general ſenſe, as the Art of pre- ' ſerving the Memory of Man, as well as his Body, it is very ' extenſive and infinite. In this ſenſe, all the Monuments ' of the Ancients, Statues, Poems, Writings, *&c.* may be ' eſteemed a kind of *Embalming*: And in the ſame reſpect, ' *Fame* may not improperly be called the Goddeſs and Patroneſs

'troneſs of *Embalming*, and *Mercury* her chief Miniſter, to 'proclaim to the World the Heroic Acts of memorable and 'famous Men. Secondly, Having ſhewn that all things 'intended to preſerve a Name may be comprehended under this general ſenſe of *Embalming*, he ſets forth, that 'the *Balſamic* Art, properly ſo called, is at once the beſt 'and moſt durable way to compaſs that end, all other Monuments being known to decay and moulder. Thirdly, 'the *Balſamic* Art is recommended not only by its duration, but by its great uſe in other Sciences; particularly '*Phyſiology*, *Anatomy*, *Surgery* and *Phyſick*, as intimated above. Fourthly, *Embalming* is neceſſary for tranſporting 'Bodies to the Paternal Sepulchres, for which moſt People 'have a particular deſire. Fifthly, *Embalming* not only 'prevents the Plague and Putrefactions, and conſequently 'frees from the Terror and Deformity of Death, but likewiſe ſecures dead Bodies from the inſults of Inſects and 'Brutes, by reaſon of its bitter and ungrateful Taſte. Laſtly, Conſid ring the *Egyptian* way of *Embalming* by rolling, and the Modern by wrapping up in Searcloath, obſcure the Object, and are alſo imperfect upon ſeveral other accounts, the *Author* endeavours to ſhow a poſſibility of inventing a method how to preſerve the whole *Compages* of the Body for ever without Putrefaction, in ſuch manner as its Texture and Structure may remain entire, of the ſame proportion as before, and of the ſame Colour and Flexibility, without any viſible contraction, diminution or unconformity of Parts, whereby the Dead Corps may be kept by the Parents, or handled by the *Anatomiſt* without any offenſive Smell, or faſtidious *Mador*. So that Bodies thus *Embalmed* ſeem not to be dead but aſleep, waiting for the Reſurrection, and differ from the Living in nothing but Speech and Motion.

The ſecond Letter is inſcrib'd to Dr *John Lawſon*, ſometime *Preſident* of the College of Phyſicians, *London*; in which, altho *Embalming* be its chiefly intended ſcope, yet the *Author* conſidering that the *Egyptians* have been allowed to be the firſt Inventors of Arts and Sciencies, and that they were the only People who uſed this particular manner of *Embalming*, treated of in this Letter, he thought it requiſite to conſider every particular circumſtance of time and place, the ſeveral Drugs, Plants, Minerals and many other things which are advantageous to the *Egyptians* above other Nations, as alſo to enquire into the reaſons which induced them to ſtudy this Art, and after what manner they came to find it out. To this end, he gives a ſhort Geographical Deſcription of *Egypt*, and takes notice of the Salubrity of its Air and Water, with the Riſe and Courſe of the *Nile*, Fertility of the Soil and Sagacity of the People, with ſeveral neceſſary Remarks on their Religion, Cuſtoms, Arts, Diſeaſes, Phyſick and whatever elſe might tend to the Diſcovery and Knowledge of this loſt Art. Wherefore in the firſt place he ſhews how *Egypt* is ſituated and bounded, together with its Extent, Diviſion, its ſeveral Denominations, Number of Cities and Inhabitants, as alſo how it came to be ſo populous, and to be accounted the Miſtreſs of the World, and Mother of Arts and Sciences. He gives the Characters of both the Ancient and Modern *Egyptians*, with their Make, Complexion, Temper, Conſtitution, Habit of Body and Diſeaſes; how fruitful they were in Children, very long liv'd and of great Antiquity: That they were the firſt Inventors of *Phyſic*, *Anatomy*, *Chymiſtry*, *Surgery* and *Embalming*; of *Geometry*, *Aſtronomy*, *Mathematics* and the like; from whence it came to paſs, they performed greater and more wonderful Works than the World beſides. He ſhews you their opinion of the *Metempſychoſis*, and their Belief in the Reſurrection; how they came at firſt to find out *Embalming*, and how they performed it. That there were ſeveral Kinds of *Embalming*, *viz.* with *Aſphalt* or *Piſſaſphalt*, with Oyl or Gum of *Cedar*, with Aromatics and Spices. That there were ſeveral Officers belonging to this Work, ſuch as a *Clerk*, a

Prieſt, or a *Phyſician*; an *Embalmer* or *Surgeon*; a *Pollinctor* or *Apothecary*; a *Diſſector* or *Anatomiſt*; a *Salinator* or *Salter*; a *Deſigner* or *Painter*, a *Herald*, *Carver* and the like: Alſo Νεκροκοσμος a *Dreſſer* of the Dead, and Ἐνταφιαστὴς one that furniſhed all neceſſaries for *Funerals*, called in *Latin*, *Libitinarius*. He likewiſe ſhews the particular Ceremonies uſed about the Dead, ſuch as were their Coffins and Scroles painted with *Hieroglyphick* Characters, *&c.* the Books, Writings, Arms, Medals, Images, *Averruncal*, *Prophylactic* and *Polycharactariſtick* Statues; which were either included in, hanging upon, or appertaining to the *Mummies*, repreſenting their Superſtitions and Magical way of *Embalming*. Then he tells you, that after every thing was got ready for the Funeral, how the *Embalmed* Body was put on Board a Ship called *Barris*, and by the Ferryman *Charon* wafted over the Lake *Acheruſia*, and there judged and tryed according to the ſeveral Virtues, Vices and Actions of its paſt Life; and accordingly either honoured with the greateſt Praiſes and Commendations, and Magnificently Interr'd, or elſe mightily exclaimed againſt, and deprived of Sepulture: That it was this that made even the *Egyptian* Kings themſelves to live uprightly, fearing ſo much as to anger the common People whilſt alive, leſt they ſhould incur their Eternal Hatred after their Death.

Our Author likewiſe adds, that the *Egyptians*, to prevent borrowing, which was the Parent of Idleneſs, Frauds and Branglings, ſuffered none to borrow, but on condition they pawned the Body of their Anceſtor, and it was reputed both an Impiety and Infamy, not to redeem it ſo ſoon as it was poſſible; ſo precious a Pledge was it eſteemed, inſomuch, he that dyed before he had acquitted that Duty, was denied Burial. Other ſtrange Ceremonies he recounts, ſuch as putting the *Embalmed* Bodies into Caſes Carved after their own ſimilitude, and ſetting them up in Niches in their Halls and Parlours in great order and very richly adorned, where they took a great delight to ſee a long

Race of Anceſtors, in a manner with as much ſatisfaction as if they were alive and converſant with them: Nay, as ſeveral Authors aſſert, they placed them at Table like Gueſts, and made merry with them, by Eating and Drinking; but he concludes, that ſuch as Buried their Dead out of their Houſes, in the Fields and Plains, built *Sepulchres* for them, as noble as poſſible their circumſtances would admit, chuſing rather to have their Monuments magnificently built, than their Dwelling Houſes; foraſmuch as they deſpiſed the preſent Life, and took little care in building their Habitations, looking upon them but as ſo many Inns and Baiting places, where they were to inhabit but for a Seaſon; whereas the Glory of a future Life, that was to be procured by Virtue, they greatly eſteemed, and conſequently ſpent their whole Care, Study and Riches about the magnificency of their Sepulchres, which they called Sempiternal and Eternal Houſes, looking upon the time they are to dwell here on Earth, as nothing, in reſpect of the ſtay they were to make in the Grave.

The third Letter is to Dr *Hans Sloane*, Secretary to the Royal Society, and Fellow of the College of Phyſicians, *London*.

Being a ſuccinct account of the *Pyramids*, *Subterranean* Vaults and *Lamps* of the *Egyptians*; for as in the foregoing Letter was fully ſhewn the manner of *Embalming* Dead Bodies, in this the *Sepulchres* or Repoſitories wherein they were laid, is chiefly conſider'd: Foraſmuch as the *Egyptians* did not only content themſelves with preſerving their Dead from Putrefaction, but likewiſe with equal care provided *Conditories* that might be laſting as the Body, and in which it might continue ſecure, both from the Injuries of Time and Peſons, becauſe they Religiouſly believed, that ſo long as the Body endured, ſo long would the Soul continue with it, not as a quickning or animating Spirit, but as an Attendant or Guardian, without going into any other Body, as otherwiſe they thought it would, firmly believing the *Tranſmigration.* To this end therefore they built their *Hypogæa* and *Pyramids*, as laſting Monuments to preſerve them from the injuries of Time and Weather, for which reaſon they chiefly made them of a *Pyramidal form*, the better to ſecure them from Ruin. Our *Author* ſhews their Situation, Number and Founders, as likewiſe how many Men were employ'd in the building of them, together with a compleat Deſcription of the great *Pyramid*, its Entrance, firſt and ſecond Galleries, Anticloſets and ſpacious Chamber wherein *Cheops* Tomb ſtands. He likewiſe deſcribes the ſecond and third *Pyramid*, with the Lodgings of the Prieſts, and the monſtrous figure of the *Sphinx* repreſenting *Momptha*, and after various Obſervations and Reflections on thoſe Structures, he proceeds to deſcribe the *Subterranean Caves* near the *Pyramids*, together with the *Mummies* both of Men and Birds therein contained ; as alſo an Account of the *Perpetual Lamps*, ſuppoſed to have burnt in the firſt *Pyramid* and *Subterranean Vaults*, to what end they were invented, and of what matter compoſed. He ſhews how that they eſteem'd *Fire* the Emblem of the Soul and of Eternal Life, and gives the Sacred Reaſon why they inſtituted the *Feaſt* of *Lamps*, *&c.* In a word, he has given us more light into this *Art*, which contains the Hiſtory of the firſt Antiquities of the World, than any of thoſe imperfect Accounts of *Herodotus* and *Diodorus Siculus*, and has improved it in ſome things, and in others apply'd it to thoſe Uſes that have hardly before been thought of. All which renders the whole Work more compleat than any other Book wrote hitherto upon that ſubject.

VII. *An Extraordinary Caſe of a Coſtive Perſon, in a Letter from Mr* B. Sherman *to Dr* Beeſton *of* Ipſwich; *with a Note on the ſame by Mr* William Cowper, *F. R.* S.

SIR,

THis perſon, whoſe Name was *Thomas Phillips* of *Eaſthorp*, near *Keldon* in *Eſſex*, was as well in every reſpect as a Child could poſſibly be till he was a year and a quarter old; at which time a very ſtrange and almoſt continual rumbling in his Inteſtines ſeiz'd him, the conſequence was a violent Looſeneſs, for which all the Phyſicians near the place could find no Remedy: But at laſt, when they deſpaired of the Childs Life, the Looſeneſs terminated in ſuch an unuſual Obſtruction, that he did not go to Stole for a fortnight or three weeks together, and from three weeks it proceeded gradually to the intervals of 17 or 18 weeks, and ſo continued till he came to be about the age of fifteen, when his Body reſumed its natural temper, which laſted 4 or 5 years, but then the Obſtruction returned, and continued, or rather increas'd till he dyed; for it was cuſtomary with him in the laſt years of his Life not to evacuate any manner of Excrement under the interval of nineteen or twenty weeks, and ſometimes (twice at leaſt) he had no diſcharge for one or two and twenty weeks together. He lived to be near 23 years of Age, and walk'd about almoſt to the hour of his Death; for he was ſuddenly ſeiz'd with very ſick Fits (but could not Vomit), two or three of which Fits carry'd him off in a few hours; and when he dy'd it was nine weeks after he had any Stole. He dyed about a year after I wrote to you firſt concerning him. I ask'd him ſome Queſtions, which I apprehended neceſſary, as whether he did Vomit often, or had at any time any Excrementous Taſtes in his Mouth, or did Sweat much, or made more Urine than in proportion to his drinking, or whether he found any eaſe when he did either Vomit, Sweat or Urined; all which queſtions were anſwered in the Negative. When he did go to Stole he evacuated very many times in a day, and ſeveral days together, until he had emptyed himſelf. But I muſt tell you, that his Mother aſſures me, that throughout his whole Life he never diſcharg'd any other than very thin Excrement.

Before his time of Evacuation came about, he was of an extraordinary bigneſs many weeks before his going to Stole, unleſs when he could break Wind, which he often endeavour'd to do, by laying his Body on the edge of a Table or Stool, but could not often by ſo doing produce the deſired effect. He declined the uſe of all Medicines for many years before he dy'd, contenting himſelf with going to Stole once in three or four months, or nineteen or twenty weeks, as above mention'd. But that which amuſes me as much as any thing is, that he generally had a petty good Stomach, and eat and drank as the reſt of the Family did; nay, till the time that his Body came to be very full, he could do the work of a Man at Plow, or ſuch like Husbandly labour, for Agriculture was his employment. I was very deſirous to have open'd his Body, but could by no means convince his Mother of the uſefulneſs and advantage of ſuch a Diſſection, which was no ſmall regret to me, for I thought it great pity that ſuch an extraordinary caſe ſhould not be inquired into, and indeed the Miniſter of the Pariſh did preſs his diſſection very hard, but the Mother was yet inflexible. This, Sir, is the truth of his caſe, and at firſt may ſeem almoſt incredible; but when I aſſure you that I had this account from the Perſons own Mouth in his Life time, confirm'd at the ſame time by his Mother who is yet living, and has very lately repeated the ſame to me, I hope it may obtain credit with you; beſides I can aſſure you, that all the Neighbourhood will witneſs the truth of it, many Gentlemen, Clergymen and others having had the curioſity to ſee and examine the Perſon,

Mr Cowper's *Note on the foregoing Letter.*

It's not improbable, if the Abdomen *of this Perſon had been opened, but ſome of its Contents would have been found not unlike thoſe I have mentioned, in my Explication of the 34th Table of Prints publiſhed by Dr* Bidloo, *where I take notice of a young Gentlewoman I diſſected, in whom I obſerved the* Omentum *ſo leſſened, that at firſt it appeared doubtfull if that part had ever been exiſtent in that ſubject; but on ſtrict examination the little Remains of it reſembled a* Congeries *of ſmall Glandules, ſtuffed with a Suet like matter. The whole Canal of the Inteſtines, even from the* Pylorus *to the* Anus, *was diſtended with Excrements, and the Surfaces of all the ſmall Guts adhered ſo ſtrictly to each other, that they could not be parted without tearing their external Membrane, to which the* Omentum *contributed by its adheſion: The whole* Compages *of the Inteſtins very much reſembling that of the external ſurface of the Brain covered with the* Pia mater, *ſo that the Meſentery in that ſubject could not be ſeen till this external incloſure was divided. By this diſorder, 'tis certain, the Periſtaltick motion of the Guts muſt needs be very much leſſened, if not quite hindered. The* Peritonæum *alſo in that caſe was very much thicken'd, and had ſeveral preternatural white bodies ſet at various diſtances on its internal ſurface; the like appeared on the Stomach, which very much reſembled in figure the Miliary Glands on the back part of the* Aſpera Arteria.

Printed for *S. Smith* and *B. Walford*, Printers to the Royal
Society, at the Prince's Arms in St Paul's Churchyard.

BRITISH MUSEUM NATURAL HISTORY.

Fig: 1.

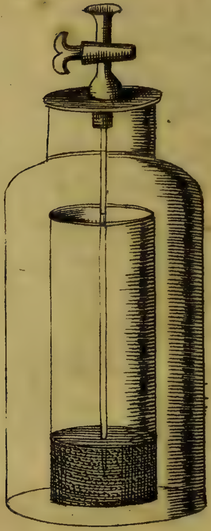


Fig: 2.

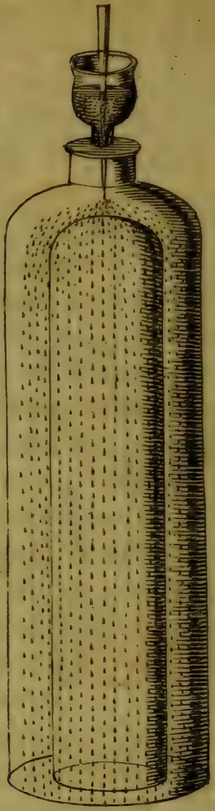
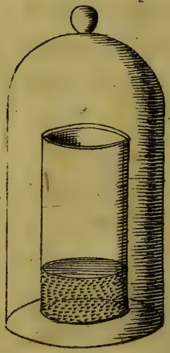


Fig: 3.



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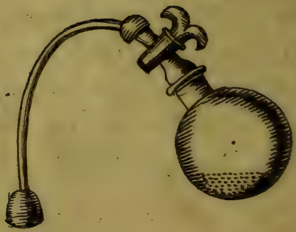

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For the Months of September *and* October, 1705.

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X. Joh. Conradi Beckeri, *Paradoxum Medico Legale de ſubmerſorum Morte ſine pota Aqua, Aliquot Cadaverum ſectionibus detectum & è principis mechanicis illuſtratum, &c.*

I. *Epiſtola* D. Antonii Meſaporiti, *M. C.* Genuenſis *ad Cl.* Antonium Valleſnerium, *Med. Pract. Prof. P. Patavin. de Eruptione Sanguinis e ſingulis fere corporis humani partibus; & de dolore Ventris ab inteſtinis in craſſam & cartilagineam ſubſtantiam concretis orto.*

GRatulari tibi, Amice, quem jam diu plurimi faciebam, venio, ſic tua te ſtudia diſpoſuiſſe, ut quo æternitati vivas ampliori nomine non indigeas. Quis enim ambigat te ad ſummum gloriæ faſtigium ipſis miraculorum alis evehendum, qui monſtra, & extra naturæ leges pacta novis typis illuſtrare ſatagis? Videbaris literarii honoris apicem attigiſſe arduo illo quidem, ſed felici opere, quo ingenioſis experimentis prima viventium ſtamina detexiſti, animaliumq; principia per tot diſputationum ambages antea agitata ad ſenſum uſque manifeſtiſſima incredibili ſtudio reddidiſti. Sed altius adhuc potuit aſſurgere liber ſpiritus, & quandoquidem ipſe ſupra ordinem eſt, ea perſequi ſibi propoſuit quæ extra ordinem ſunt. Vellem aliquod obſervantiæ, & amoris erga te mei, ob tantam excelſæ mentis alacritatem, documentum præbere, quod certe dignius præſtare poſſe non arbitror, quam ſi aliquam ex rarioribus meis obſervationibus tibi dicaverim. At conquererer oblivionis rubigine pene deletas plurimas & digniores, quas è cadaverum inſpectionibus dudum collegi, niſi penſo faveret recens longeq; curioſior *formoſæ Virginis* caſus, ad quem libens converto calamum, nil dubitans ita me pro genii tui delectatione facturum.

Honeſtiſſima viſendæq; ſpeciei Juvenis, cui natura ad 18 annum, integerrimam valetudinem hilaremq; genium dederat, per multiplices nunc ducta morborum modo incidit in fluxum ſanguinis ex inuſitatis partibus, & tandem in deterrimam partialis ſudoris ſpeciem ex ambitu corporis. Quamprimum in eâ ætate concipiendæ ſpei aptiſſimâ gravi ſenſu correpta fuit, poſt diuturnum ſtomachi laborem cœpit ſanguinem tuſſi expuere occaſione ementitæ pleuritidis, quâ die nonâ *Aprilis* febricitabat cum dolore lateris, & difficili reſpiratione: *Quarto* inſultûs *die* thoracis morbo evaneſcente, capitis dolore, quo & antea laboraverat, gravari, & ſine levamine ſanguinem fundere è naribus obſervabatur quocirca hujus copiam è pede detraxit *Chirurgus Familiaris*, qui bis eductum primis diebus ex brachio gelatinoſum inſpexerat. Verum haud decreſceret morbus, qui conceptum virus in promptu habebat movere ad ulteriora ; hinc ſuperaddita eſt afflictæ Juveni Cardialgia, unde vomitus primum viſcidi, & viridis humoris, mox ſanguinis, nec proinde capitis ægritudine allevabatur, quin circulo quodam ordinato recurrentibus purpureus liquor ex utraque parte, & ad multos dies prodibat. Malorum importuna viciſſitudo nimis adhuc increbuit, cum circa initium *Maii* erumperent Menſes, & prout ipſi mos erat in ſufficienti menſurâ. Quid inde opinaretur Chirurgus, qui uſq; modo ſolus curationi aderat, haud potui ab ipſo ediſcere. *Mannæ* potionem exhibuit poſt ſeptimum diem, & ab ea licet non parum perturbata in pejus ægra ruere videretur, attamen paulo poſtea febris in totum ceſſavit, quæ antea plus vel minus una cum vigiliis ingraveſcens fuerat continua. Vix per integram hebdomadam habuit otium morbus, cum febris rurſus invaſit comitata dolore artuum, & potiſſimum ventris, quibus licet ſeſe citius expediverit abſumpto nempe *oleo Amygd. dulcium rect.* ſine igne extracto, nihilominus conſtans vomitionis moleſtia, & ſanguinis jactura ſummopere urgebant.

Diro Symptomati ut occurrerent Clariſſimi Medici, conſuluerunt in minori doſi, & per vices ſanguinem ex

Salvatella detrahere, anodina, adſtringentia, & alia quam plurima adhibere; quod etſi executioni mandatum fuerit, inconſtanti methodo procedens affectus, frequentiores excretionum vias fere omnes cum attigiſſet, cæpit per inuſitatas errare.

Cum igitur circa initium *Junii* theſaurus vitalis ex auribus effluxiſſet, paulo poſt curioſiori ſpectaculo ex acumine digitorum primo manuum, deinde pedum ſe fundere viſus eſt: Mox ex umbilico, & ex angulo oculi; hinc pluries per ſudorem, inde tandem ex medio pectore, poſtea ex pede, eoq; loci, ubi tunditur Saphena, tandem ex utraque volâ manuum, & ex oppoſita parte; poſt biduum ex mento, noctu ex acumine linguæ, ita ut quatuordecim dierum ſpatio diſcrimen hoc, veluti fabuloſum maxima ex parte abſolverit. Motus novitate rei, & Amicorum impulſu veni ad Juvenem, quam miratus viribus mediocriter conſtare, & jucundo vultu ſingula mihi enarrare, prout ab aliis audiveram: Adhuc cernere erat ſuperſtitem cicatriculam in volâ ſiniſtræ manûs ad inſtar inæqualis puncturæ leviter impreſſam, unde ſanguis pridie fluxerat, retulitq; id non ſine ſenſatione triſti factum fuiſſe, uti ſemper contigerat, cum ex ſpeciali loco prodiret; ubi vero ex pectore, aut aliis partibus ſudoris ſpecie emanaverat, nullum apertum pori reliquerat veſtigium; id tantum ex induſiis patebat, quorum duo vidi ad latitudinem ſcuti aurei cruore roſeo ſparſim colorata. Die 14 *Junii* apparentibus menſtruis juſtò copioſioribus, inde ſublatum morbum nonnulli crediderunt, potiſſimum quòd viginti dierum inducias feciſſet. Verum inchoato altero ſudoris exordio, & ad multum tempus procedente miſcella debilitari ſentiebatur, & ſanguis diſcolor apparere. Hinc recreandi ſpiritus, mutandæq; fortunæ gratiâ in alterum aerem ſeſe tranſtulit. At qualis ſeceſſerat, rediit ad Urbem die quinta *Auguſti*, imò infirmior, quod præter morbi acerbitatem, artis quoq; methodo exhauſtâ ulteriorem jacturam fuiſſet experta. Hinc non diſſimili modo progrediente ægritudine, & paucis tantum habitis intervallis effundendo ſanguinem modò ex unâ parte, modò ex alterâ, ſæpius per ſudorem, quod reliquum erat ejuſdem menſis, & medium *Septembris* confecerat. Petii ægræ domum, & confabulando diutius cum immorarer, accidit, quod forte expetiveram, ex dolore lancinanti in extremo unius digiti manûs admonitam fuiſſe ſanguinem inde extillaturum, quem notavi, veluti ex profundiori puncturâ, mox ex altera parum diſtanti guttatim decidere, & induſium ſupra Pectus recenti maculâ ſignari videram priuſquam recederem. Poſt triduum mirabiliorem ſanguinei ſudoris copiam exhibuit, quo ſe multis crucibus aliiſq; characteribus Divinæ Paſſionis induſia ſupra pectus depingebantur. Hujus rei primi inſpectores Aſtrologis aſſimilandi videri poterant, quòd, ut iſti ex Stellis, ita illi ex ſanguinis Aſteriſmis varias figuras propria imaginatione componerent: vere tamen clareq; apparebant figuræ; Unde factum id fuerit prorſus ignoro; & quoniam *Sacri Antiſtites* id ſtrictiùs inquirendum minimè judicarunt, ita veritati ſuæ relinquens ad finem Hiſtoriæ redeo. Vel nullum, aut exigui momenti ſudorem deinceps paſſa eſt. Attamen reticere non debeo ex levi excoriatione ſupra maleolum caſu torturæ pedis factâ uberiorem inde penum ſeroſitatis effluxiſſe, ut ſtypticis remediis, & compreſſis faſciis non facile ſiſteretur.

Inauditi eventûs difficultas commovit ingenia Phyſicorum: Non naturale prodigium exiſtimaſſet vulgus, niſi plures Hiſtoriæ in promptu fuiſſent. Omnium Senior Medicus *Fabricius Ardiſonus*, qui nonageſimum attingit annum, retulit mulierem annorum triginta ſe olim curaſſe, cui ſuppreſſæ erant menſes, & ſanguis ad multum tempus ex oculi angulo fluebat, revocatis nimirum Menſtruis ad conſueta naturæ. Extant & alia exempla videnda apud Auctores, *Benivenium*, *Hollerium*, &c. Attamen horum omnium obſtructio aliqua inculpanda venit, unde ſanguis extra vaſorum confinia cogeretur. In præſenti caſu alio ratiocinio procedendum eſt, quòd obſtructionum idea non obſcure locum non habeat. Sanguinis tantum ſubtiliſſima craſis in conſpectum venit, unde color ejuſdem roſeus in principio, mox dilutus ſatis apparuit. Nec aliquis dicet in principio fuiſſe obſervatum gelatinoſum, hoc enim minimè evincit craſſiorem ſubſtantiam, ſed partium tantum concreſcibilium majorem elixationem, idq; præſertim fit obvium, cum educitur ingraveſcente febris acceſſione. Pluribus abhinc annis aderam cum Nobili filiolæ, occaſione acuti morbi vena tundebatur, & vidi album ſerum & tenue emanare loco cruoris, & concrevit. Attamen haud inficior eam cauſam, ut adæquatam, minimè poſſe ſufficere, multo minùs poſſe arridere Naturæ Myſtis, quibus certam & inſenſibilem quandam cruoris diſpoſitionem hariolandam mitto. Hoc ſtudium deponere me plura docuerunt, non modò, quod praxim exercentibus, cum ad minus ſenſibilia diſtorquemus ingenium, urgente ægritudinum ſtatu, fallimur; verùm quia & ipſæ *Obſervationes Anatomicæ* plane evincunt ut plurimum inveniri aliquod inſigne, quod in mente excidere nunquam poterat. Liceat mihi dare exemplum, quia rariſſimum, etſi minus faciat ad rem propoſitæ Hiſtoriæ.

Acceſſit curandus nuper elapſo menſe *Octobris* Vir Ruſticus, & ex multo tempore extenuatus, laborans torminibus ventris, atq; Hypocondriorum Spaſmodicis contractionibus; nil fere dejiciebat per inferiora, & continuo languore exolutus ſpiritu tandem defecit. Non eſſet qui non deduxiſſet morbum hunc ad Siccatorium ex *Hippocrate* appellatum, maxime quod quæ ab Hypocondriis obſtinate vel deformiter procedunt ad Proteiforme referre omnes conſueſcimus; hinc in fermentis & ſuccis Tartareis poſitâ cauſâ Syndromen totam explicare parum quiſq; laboraſſet. Aperto cadavere invenimus inteſtina craſſa, præcipue ubi in vicinia *Duodeni* flectuntur, mediis protuberantiis calloſis invicem, & cum adjacentibus conſolidata, ut obſcurum eſſet unum ab altero disjungere, &, quod pejus erat, eorum ſubſtantiam ad inſtar duriuſculæ cartilaginis concretam, & craſſam, ut nulla fere cavitas amplius ſupereſſet. Itaq; rejicere ulteriorem indaginem eorum quæ magis recondita ſunt dicam cum Philoſopho morali, *totam rerum naturam umbram eſſe aut inanem aut fallacem, neq; me iraſci illis qui nihil nos ſcire volunt, neque illis qui me hoc quidem nobis relinquunt.* Tu interim amice, quem diutius amare me vellem, ut diu valeas cura.

Genuæ, Decembris 5. 1703.

II. Gulielmi Cockburni *M. D. Solutio Problematis de Purgantium & Emeticorum Medicamentorum Doſibus determinandis in quacunque Hominis Ætate, Temperamento, Temperamenti varietate per univerſum Terrarum orbem, ab ipſo menſe* Martio *proxime elapſo, in Actis Philoſophicis propoſiti. Et Illuſtri admodum Doctoque D.* Edwardo Southwell, Annæ *Reginæ a Secretis* Hibernicis, *&c. conſecrata.*

QUo rectiùs diverſas emeticorum & purgantium Medicamentorum Doſes, pro Temperamentorum & Ætatum varietate, decernamus. Supponendum eſt, *Primo,* iſtiuſmodi Medicamenta nihil prius poſſe operari quàm in Sanguinis maſſam appulerint, & eidem penitus immiſceantur: Conſtat enim, ni Nauſeam moveant, nullum ab iis effectum ſenſibilem produci multo poſt tempore quo in eandem devehi poſſint. *Secundo,* generaliorem eorum effectum eſſe temperamenti ſanguinei aliorumque Liquorum gyrantium Alterationem.

Ex hiſce duobus Poſtulatis concludimus, quod ubi Sanguinis Craſis eſt eadem Medicamentorum Doſes, ad certum aliquem eliciendum effectum, ſanguinis Quantitati proportio-

nales

nales eſſe: Si namque certa quædam Doſis exigatur ad unius Libræ ſanguinis v. gr. Craſin alterandam ad certum aliquem gradum, duplicem oportebit Doſin adhibere ut Libræ duæ ad eundem gradum alterentur, triplam ut tres, *&c.* Et univerſaliter ſi ſanguinis Quantitas *b* exigat Doſin *d*, quantitas ſanguinis *mb* Doſin *md* exiget, & eſt *b* : *d* :: *mb* : *md.*

Coroll. Quum Quantitas ſanguinis & cæterorum humorum in gyrum actorum rite, ex Animalis pondere, poſſit æſtimari (partes enim quas ſolidas nuncupamus ſunt tantum Canales qui liquores iſtos continent) exinde ſequitur Doſium quantitates, *cæteris paribus*, eſſe corporis ponderi proportionales; adeoq; Medicamentorum Doſin Infanti, recens nato, propinandam eſſe ad eorundem doſin provectioris ætatis Hominibus ut eſt Infantis pondus ad Hominis. Exempli cauſâ, pilularum Rudii gr. xxx unicâ plerumq; doſe Homini exhibentur, & Hominum Pondus commune eſt 160 Librarum, & Infantum Librarum 12; quapropter, ut ſunt 160 Hominum Pondus ad 12 Infantum, ita ſunt gr. xxx Hominum doſis ad gr. $2\frac{1}{4}$ quæ ſunt Infantum; ac ſemper in eâdem ratione Medicamentorum doſes augendæ veniunt ut creſcit Infans; dehinc doſes exhibendæ manent eædem ad annum quinquageſimum, ex quo tempore ſanguinis quantitas & vis quotidie minuuntur, quâ quoque ratione minuendæ ſunt Medicamentorum Doſes.

Hâc ratiocinandi methodo, Homines omnes eodem gaudere Temperamento ſimul & Augmentum Ordinemq; ſecretionum, ad annorum numerum, eſſe æqualem ſuppoſuimus; id enim vult ſimplicior meditandi modus: Quum verò hominum Temperamenta, ſeu Conſtitutiones, ſint diverſiſſimæ pro variâ ſanguinis humorumq; gyrantium Craſe, Doſium quantitates non ſemper proportionantur corporis ponderi. Diverſum id ſanguinis temperamentum in certâ quadem partium ejuſdem cohærendi diſpoſitione conſiſtit, quâ ſanguis magis vel minus fluidus evadit; unde provenit quòd medicamentorum in ſanguinem Operationes fiant diverſæ pro variis Cohærentiæ gradibus. Ponamus enim homines duos æquali ſanguinis quantitate pollentes, cujus Cohærentiæ gradus ſint diverſi; manifeſtum eſt, medicamenta iſta facilius laxioris texturæ ſanguini admiſceri quàm firmius cohærenti, commiſcendiq; Proclivitas quam habent medicamentorum partes particulis ſanguinis eſt ſemper ut Fluiditas directe vel reciproce ut eſt ſanguinis Tenacitas, & medicamenti in ſanguinem vis erit in eâdem ſimiliter ratione: Adeoq; ut medicamentum in iſtis diverſi temperamenti Hominibus æqualiter operetur, propinandæ doſes ſanguinis Tenacitati proportionales eſſe debent, ſupponendo itidem ſanguinem in utroq; pari Celeritate circuitum agere. Si vero ſanguinis velocitas ſit diverſa medicamentorum operationes, *h. e.* Secretionum quantitas ab eis producta, erunt ut ſanguinis Velocitas: Secretiones enim in qualibet Glandula, in dato tempore, ſunt ſemper ut ſanguinis quantitas quæ in eandem glandulam eodem tempore devehitur, *h. e.* ut ejus Velocitas. Sanguinis etiam velocitas, *cæteris paribus*, ſemper ſe habet ut ejus Fluiditas, ſeu reciproce ut ejus Cohærentiæ gradus: Si igitur ſanguinis Velocitas eſſet unice conſideranda, hoc caſu quantitas doſium ad eundem effectum producendum erit directe ut cohærentiæ gradus in partibus Sanguinis.

Prop. I.

In hominibus duobus æqualem ſanguinis quantitatem habentibus ſed Cohærentiæ gradibus differentis, Medicamentorum Emeticorum & purgantium doſes, ad eundem effectum eliciendum neceſſariæ, ſunt in duplicata ratione graduum cohærentiæ ſanguineæ.

Ubi enim Sanguis eâdem velocitate movetur, doſis quantitas ut cohærentiæ gradus ſit oportet, & ſi gradus cohærentiæ eſſent iidem doſis quantitas eſt reciproce ut velocitas; adeoque, ubi nec cohærentia nec velocitas ſunt eædem, quantitas doſis eſt in ratione compoſita ex directa ratione graduum cohærentiæ in Sanguine & reciproca velocitatis: Atqui reciproca velocitatis ratio eſt directæ Tenacitatis vel cohærentiæ graduum rationi æqualis. Ideoq; Doſis quantitas eſt in ratione compoſita graduum cohærentiæ & graduum cohærentiæ, *h. e.* Doſes propinandæ ſunt in duplicata ratione eorundem Q. E. D.

Prop. II.

Doſium quantitas hominibus diverſæ quantitatis ſanguinis exhibenda, qui ſimul diverſis pollet Cohærentiæ gradibus, eſt in ratione compoſita ex ratione ponderis hominum & duplicata graduum Cohærentiæ.

Quum enim cohærentiæ gradus ſunt iidem doſium quantitas eſt ut hominum pondus, & ubi hominum pondus eſt idem doſium quantitas eſt in duplicata ratione graduum cohærentiæ, adeoque, quum neuter eſt idem doſis quantitas eſt in ratione compoſita ex ratione ponderis hominum & duplicata graduum cohærentiæ. Q. E. D

Coroll. Hinc Quantitatem & Qualitatem Sanguinis in quolibet homine ſcientes doſes ad purgandum & vomendum neceſſarias non ita arduum eſt determinare. Hæc qualitas, ſeu Temperamentum, ſanguinis a perito Medico ex Pulſibus Urina & aliis ſecretionibus facile invenitur; adeoq; Medicus, obſervando quæ doſes datæ conſtitutionis homines purgant, minimo negotio doſes cuilibet conſtitutioni vel Temperamento idoneas ſtatuet.

Schol. Quæ hactenus in genere demonſtrata ſunt, ex vulgari Medicorum circa Purgationem & Vomitionem Hypotheſi eodem ſequerentur pacto; quoniam Diſpoſitio, quam habent Ventriculus & Inteſtina ut ſtimulentur, eſt ut memorati quantitatis & Cohærentiæ in Sanguine gradus. Ita, vel ex illa Suppoſitione, Veritas hæc maxime conſtaret, licet poſtulati ſimplicitate deſtituitur, atq; ob id non adhibetur.

Londini, 4*to Non. Febr*. 1706.

III.

III. *An Explanation of the Rule for the finding of* Eaſter. *In a Letter from the Reverend Mr* J. Jackman *to Dr* Hans Sloane, *S. R. S.*

HAving met with ſeveral Explanations of the Rule for *Eaſter* in our *Common-Prayer-Book*, and two publiſh'd among the *Tranſactions* of the *Royal Society*, but none right and ſufficient; and having undoubtedly collected the true ſenſe of the ſame, by comparing the ſaid Rule and the Table for *Eaſter* in the *Common Prayer-Book* together, I have been perſwaded to communicate it to you, in order to be inſerted (if you think fit) in the next *Philoſophical Tranſactions*, as here follows.

The Rule is thus worded, *viz.*

> Eaſter-day *is always the firſt* Sunday *after the firſt full Moon, which happens next after the one and twentieth day of* March. *And if the full Moon happens upon a* Sunday, Eaſter-day *is the* Sunday *after.*

For the right underſtanding of which it is ſufficient to obſerve,

1. That the full Moon meant is the 14th day of the Moon, according to the Kalendar in the *Common-Prayer-Book* (which may be call'd the Church-Kalendar) counting that day of the Month for the firſt of the Moon, which hath the Golden Number of the Year collateral to it in the firſt column of the ſaid Kalendar. And
2. That theſe words [next after *Mar.* 21.] are meant incluſively, as if it had been ſaid [next after the commencement of *Mar.* 21.] ſo that if the full Moon happens on *Mar.* 21. the ſame muſt be the Paſchal full Moon.

Now, in order to prove theſe Obſervations are both right, and ſufficient for the underſtanding of the Rule, I ſhall only ſuppoſe (what all Men of Senſe and Candour will, and all Maintainers of Rule muſt, allow) That if they are neceſſary and ſufficient to reconcile the Rule with the authentick Table to find *Eaſter* (from which Practice never varies) then are they right and ſufficient. Which being premiſed,

1. I prove that the firſt Obſervation is neceſſary to that end : Becauſe, if the Paſcal full Moon be any day before or after the 14th of the Moon by the Church-Kalendar, then the Rule and the Table will claſh. For 1. If it be any day before, then as often as the ſaid 14th of the Paſchal Moon is a *Sunday*, that very day, at lateſt, muſt be *Eaſter-day* by the Rule, as being a *Sunday* after the full Moon therein meant : Whereas by the Table and Practice it is not till the *Sunday* after that. Thus *Sunday*, *Apr.* 1. this year (1705.) was the 14th day of the Moon by the Church-Kalendar, and therefore muſt have been *Eaſter-day* (or after) by the Rule, if the full Moon therein meant had been any day before the ſaid 14th of the Moon, whereas *Eaſter-day* was *April* 8. by the Table, and accordingly obſerv'd. And this obliges us not to underſtand the true full Moon by the full Moon in the Rule, becauſe that happens about four days before the 14th of the Moon by the Church-Kalendar. 2. If the full Moon meant in the Rule be any day after the 14th of the Paſchal Moon by the Church-Kalendar, then as often as the ſaid 14th happens to be *Saturday*, and conſequently the full Moon meant in the Rule to be the *Sunday* following at ſooneſt (that being the very next day) that *Sunday* cannot be *Eaſter-day* by the Rule ; whereas by the Table and Practice it is. Thus *Saturday, April* 4. 1702. was the 14th day of the Moon by the Church-Kalendar ; and therefore if the full Moon meant in the Rule were any day after that, it muſt have been on *Sunday April* 5. at ſooneſt, conſequently *April* 12 at ſooneſt muſt have been *Eaſter-day*

by the Rule ; whereas *April* 5. was *Eaſter-day* by the Table and Practick : And this evinces the miſtake of thoſe, who make the 15th day of the Moon to be the Full in the ſenſe of the Rule ; as Dr *Wallis*, *Philoſ. Tranſ.* 240. Mr *Wright*, in his *Poſtſcript* to his *Short View of Mr* Whiſton's *Chronology*, *&c.* and the *Introductio ad Chronologiam* (Reprinted at *Oxford*, *A. D.* 1704.) p 37.

2. I prove the ſecond Obſervation neceſſary to the ſame end ; becauſe a full Moon in the ſenſe of the Rule, (*viz.* the 14th day of a Moon by the Church-Kalendar) often happens on *March* 21. and in that caſe the *Sunday* following is always *Eaſter-day* by the Table and Practice ; whereas it muſt be a month after by the Rule, unleſs we underſtand theſe words, [next after *March* 21.] as I explain them. And this will be the caſe next year (1706.) nor doth the proof of this point need the ſuppoſition of the foregoing, (tho' that may now be fairly ſuppoſed, as being already prov'd:) for,count you the full Moon how you will, *March* 22. can never be *Eaſter-day* by the Rule, unleſs *March* 21. may be the Paſchal full Moon by the ſame ; and yet *March* 22. is *Eaſter-day* by the Table and Practice, as often as the Golden Number is 16, and the Dominical Letter D.

I am aware that this 2d Obſervation may ſeem to many forc'd and unnatural ; and that, perhaps, might induce ſome to count the 15th day of the Moon for the Full in the Rule, and Mr *Thornton*, *Philoſ. Tranſ.* 297, to ſubſtitute *March* 20. in Leap-years for *March* 21. neither of which *Hypotheſes*, however, do any ſervice, all things conſider'd. The former indeed would vacate my ſecond Obſervation,(*March* 21. never being the 15th day of the Moon by the Church-Kalendar) but then it would make the Rule notoriouſly irreconcilable with the Table and Practice, as hath been already ſeen. And, as to Mr *Thornton*'s *Hypotheſis*, 1. The only colour for it (*viz.* That at the time of the Council of *Nice* the *Vernal Equinox* was *March* 20. in Leap-years, and not *March* 21. as in Common years) is, for any thing that I know, more likely to be falſe than true, and doth by no means follow from the Intercalation. 2. If this Colour were true, it were too great a nicety to have been probably regarded by the Church. 3. This *Hypotheſis* puts more force upon the words of the Rule than mine. And, laſtly, If it were admitted,it would ſolve the difficulty only in Leap-years; and my ſecond Obſervation would ſtill remain neceſſary, becauſe the caſe happens as well in Common as in Leap-years; whereof we have an Example in the next year (1706.) Nor will my ſecond Obſervation be much boggled at by thoſe that know and conſider the incluſive way of reckoning uſed by the *Romans*, and from them deriv'd to all the *Latin* Churches, and particularly that of *England*; for 'tis as proper to ſay [next after *March* 21.] with the meaning I contend for, as to ſay, *Tertio* (*ante*) *Calendas, Nonas vel Idus* in the ſenſe of the *Roman* Kalendar, or, as to ſay (as our Church doth a little after this Rule for *Eaſter*) that *Aſcenſion-day* is forty days after *Eaſter*, intending *Eaſter-day* itſelf to be one of thoſe forty. And 'tis obſervable in this very Rule, that, after it had been ſaid, that *Eaſter-day* is always the firſt *Sunday* after the full Moon, *&c.* 'tis added, that if the full Moon happens on a *Sunday*, *Eaſter-day* is the *Sunday* after; which had been a groſs Tautology, if by the firſt *Sunday* after the full Moon might not be underſtood the day of the full Moon itſelf,when happening to be *Sunday*. And if the *Sunday* of the full Moon may be ſignified by the firſt *Sunday* after the full Moon, then the full Moon of *March* 21. may be ſignified by the full Moon next after *March* 21. 3. I prove that my two Obſervations are ſufficient to reconcile the Rule and the Table; becauſe I my ſelf have drawn up a Table to find *Eaſter* for ever by the Rule underſtood according to thoſe Obſervations, and in the plain and obvious ſence in all other reſpects, and, upon comparing, have found it to agree in every particular with the Table for the ſame purpoſe in the Common Prayer Book; and any body elſe may make the ſame tryal: which method, if others had taken to examine their Explications of the Rule by,they muſt have diſcovered their miſtakes.

Stonel eigh-houſe, *Oct.* 13. 1705. III. *Part*

III. *Part of a Letter from Mr* Ralph Thoresby, *F. R. S. to Dr* Hans Sloane, *S. R. S. concerning ſome* Norman *Coyns found at* York.

I Had ſeveral weeks ago given you an account of ſome old Coyns lately found at *York*, but that I forbore, in hopes to make the account more perfect; which is as follows: Mr *Samuel Buxton*, late Sheriff of that Ancient City, deſigning to Build upon a Piece of Ground he had bought in *High Ouſegate*, had Labourers to remove the Rubbiſh of a former Houſe; which, with about 30 more, was burnt down *April* 3. 1694. In digging below the Foundations of the former Houſe, at a conſiderable depth they diſcovered the more Ancient Foundations of an older Fabrick, very probably unknown to the Builders of the later Houſe. Theſe lower Foundations were very well ſupported at ſeveral Angles with good Oak Piles, ſome of which were ſo firm and ſound, that they were good again for the ſame purpoſe; beſides theſe Piles, there were ſeveral great Timber-trees, that lay athwart, to make the ſtronger Foundation: Betwixt the head of two Piles in this lower Foundation, the Work-men found a little decayed *Oak-box*, wherein had been hoarded about 200 or 250 pieces of the *Norman Coyns*; but age and the moiſture of the place had ſo defaced them, that not much above 100 of them could be preſerved: Through the Gentlemans kindneſs (who preſented me with ſome of them) I had the peruſal of about half that number, (the reſt being given away before I heard of them) which proved the nobleſt ſtock that ever I ſaw, or indeed, heard of, of *William the Conqueror*'s Coyns; not above 2 or 3 in the whole Cargo that I ſaw being of any other Prince: Thoſe, tho later in

time,

time, are more rare in value than many of the *Roman* and *Saxon Coyns*: theſe lower foundations alſo very well anſwer the account we have of the *Timber-buildings* in thoſe Ages.

The Coyns are very much alike; the King is repreſented full-faced, with a Crown and Labels, but neither Scepter, Croſs or Star, as in other Moneys of his that I had before; moſt of them are inſcibed *WILLEMV REX*, which ſome have miſtaken for *William the 2d*; but by the declining of the ſtrokes, it appears to be deſign'd for *V*, as I have one with the *S* after the *V* and before *REX*. By this accident there appears greater Variety, than ever was known before, of the *Conqueror*'s Money, thro the kindneſs of Mr *Buxton* and others. I have of theſe ſorts, *WILLEMV REX. WILLEMVS REX. WILLEMV REX. I.* (which is not to be reckoned a Numeral Letter, it being improper to pretend a diſtinction, when there was none of the Name before, but for part of the Letter *A*) *WILEM REX A.* (*Angliæ.*) And for the Reverſe I have that were Coyn'd at *LUNDRE.* (*London.*) *EOFER-wick.* (*York.*) *WINC* (*Wincheſter.* *EXETE* (*Exeter.*) *LIN* (*Lincoln*, I preſume, *Lyn-Regis* not being old enough.) *LINCOL* (*Lincoln.*) *DEOTFORND* (*Thetford.*) and *LOYNC* (which I take for *Loyn* or *Lancaſter.* I have only one duplicate, which I preſent to you, and hope you will find it ſafe in the Seal of the Letter; 'tis inſcribed + *WILLEMV REX* I. Reverſe + *DEII. IRD ON LIN.*

V. *Several Experiments on the Mercurial* Phoſphorus, *made before the Royal Society, at* Greſham-College, *by Mr* Fra. Hauksbee, *F. R. S.*

Experiment I.

Shewing that Light is Produceable from Mercury, by Paſſing Common Air through the Body of it, after the Receiver is well Exhauſted.

I Took a Glaſs Recipient open and grownd at both ends, whoſe content was Equal to about 30 ounces of Water: The upper Orifice of which was cloſ'd with a Braſs plate, by means of a wet Leather laid on the edge of it. In the middle of which Plate was ſcrew'd a Stopcock; from whoſe lower Orifice was inſerted by Cement a ſmall Glaſs Tube, reaching from thence to near the Bottom of a Glaſs, included in the premention'd Receiver. In which Glaſs was put as much Quickſilver as would cover the Bottom of the Tube about a quarter of an Inch. Thus prepar'd, (ſee *Fig.* the 1ſt) and plac'd upon the Pump, the Stopcock was turn'd, to hinder the Airs paſſage that way, till the Receiver was ſufficiently exhauſted. Which being done, and the Stopcock return'd, the Air then ruſht ſtrongly through the Body of the Mercury, (by Paſſing the Tube before mention'd) Blowing it up with Violence againſt the ſides of the Glaſs that held it, appearing all round as a Body of Fire, made up of abundance of Glowing Globules, Deſcending again into its ſelf. The *Phœnomenon* continuing till the Receiver was half Repleat with Air.

Experiment II.

Shewing that Mercury will Appear as a Shower of Fire, whilſt deſcending in vacuo *from the Top to the Bottom of a tall Receeiver.*

A Tall Receiver being provided about 21 Inches high, to whoſe upper Orifice was ſcrew'd a Glaſs, reſembling thoſe now commonly us'd for Cupping, having an open Paſſage through the Neck of it; in which Paſſage was Cemented a piece of ſmall Tube, drawn taper to one end by the flame of a Candle, which with the Cup then made an entire Funnel. The ſmall Aperture of which was ſtopt with a round piece of a Stick as a Plug, to prevent the Mercuries entring the Receiver before its time. Within this tall Recipient was included a Glaſs about the height of 17 Inches, with a Round Crown like a Shade, (as they generally call ſuch as are put o're Images to keep them from Duſt.) In this manner (ſee *Fig.* 2.) being plac'd on the Pump, and about a pound aud a half of Quickſilver put into the Funnel, (preſuming now to call it ſo,) the Air was began to be withdrawn, and in two minutes of time was ſufficient to exhibit the *Phœnomenon.* For then Looſning the Plug that ſtopt the Funnel, the Mercury, by the Preſſure of the Air, was driven violently into the Receiver, ſtriking ſtrongly on the Crown of the Included Glaſs, which broke the Quickſilver into ſmall Particles, deſcending all around the Expos'd ſides of both the Glaſſes, appearing like a Shower of Fire in a very ſurprizing manner. The form of the Receiver, as well as the Included Glaſs, was very diſtinguiſhable by its light, and continu'd ſo till all the Mercury had entred thro the Funnel. What more occurr'd to my Obſervation was, That the Deſcending Mercury did more reſemble the falling of Snow, by the ſlowneſs of its motion, than that of Rain. That none of it appear'd luminous but what deſcended Contiguous to the ſides of the Glaſſes. That the Globules of Mercury deſcended ſome quicker than others, according to their Different Magnitudes. That the Deſcending Globules of Light (as by a ſtrict Obſervation I have ſince made) did not ſlide down the ſides of the Glaſſes, but were carried round by their own weight, as if they were turn'd on an *Axis*: Which is very well worth notice, That the Deſcending Globules had a Double Motion, the one Perpendicular, the other as a Rotation on an *Axis*. And in that motion the Adhering parts of Quickſilver were continually tearing from the ſides of the Glaſſes, producing an Apt form, which in ſuch a *medium*, from ſuch a Body, exhibits Light. That the ſmaller Globules, whoſe weight were not ſufficient to cauſe their Deſcent, remain'd opake, there being (in this as well as all other Mercurial Experiments) no Light to be obtain'd without Motion. That the ſame Motion given to the like Globules of Quickſilver in common Air, produce not the ſame Effect, as I have lately try'd, by forcing Mercury through Leather, by Condenſing Air ſtrongly on the ſurface of it. From all which it ſeems to appear very Plain, that there is Requir'd the Concurrence of a Proper Figure, *Medium*, and Motion, to Produce the Mercurial *Phoſphore*.

Experiment III.

Shewing that it requires not ſo thin a Medium, *as is made by the Weight of the Mercury in the* Torricillian *Experiment, to produce the Mercurial Phoſphore.*

TO try whether ſo thin a *Medium* as a *Vacuum*, or the Neareſt Approach to it, was Abſolutely neceſſary in the Production of ſuch a Light as is Diſcoverable in the Barometer, by putting the Mercury in motion, I made uſe of the Gage belonging to my Air Pump, as (I thought) the moſt Proper Inſtrument for that Purpoſe. (Which Gage being ſo well known to this Society, I need not here trouble you with a Deſcription of it.) Upon the Plate of the Pump I plac'd a ſmall Receiver, the Air from which being

with

withdrawn, the Quickſilver in the Gage was Elevated to 29 Inches and a half. Then ſuffering ſome Air to re-enter the Receiver by the Cock, the Mercury in the Gage deſcended, and made ſeveral Vibrations before it became ſtagnant: In all which it appear'd Luminous only whilſt Deſcending, till the Quickſilver was Purpoſely Broke by a Violent Agitation of it. Then the Separate Parts appear'd Light on their under Surfaces, which became Concaves during their Aſcending, as the other were when they exhibited their Light Deſcending: The Convex Surfaces being always opake. Theſe Appearances continu'd upon every admiſſion of Air, till near half was admitted. But after that, tho the Mercury had the ſame Motion given it as before, yet no manner of Light did enſue. Hence it readily concludes, that notwithſtanding the Mercurial *Phoſphorus* in the *Torricillian* Experiment, is not produceable in ſo denſe a *Medium* as Common Air; ſo on the other hand, it requires a *Medium* not ſo Thin by much as the neareſt approach to a *Vacuum* to Effect it.

Experiment IV.

Shewing that a Conſiderable Light may be Produc'd from Mercury in a Glaſs, by giving it Motion before the Receiver is quite Exhauſted.

HAving provided ſome Quickſilver, very fine, and free from the leaſt Appearance of Soil on its Surface, the Glaſs which held it being likewiſe very Clean and Dry; which Glaſs, with the Contain'd Mercury was Included within a Receiver on the Plate of the Pump, (in form of *Fig.* the 3d,) From which I preſently began to withdraw the Air. But before it was quite Exhauſted, (the Mercury in the Gage not exceeding 28 Inches, the Barometer at the ſame time ſtanding at 29 Inches and a half) the Pump was ſhaken, by which means the Mercury in the Included Glaſs being put in Motion, exhibited ſuch a Light, that not only the Receiver and Included Glaſs were diſtinguiſhable by it, but Hands and Fingers on the outſide were ſo too. It is to be obſerv'd, that altho the Quickſilver would give a Light upon a ſmall motion, yet would that Light be inhanc'd by the encreaſe of that Motion. What farther occurr'd was, That when a pretty brisk Agitation of the Mercury was given, it would reſemble Waves of Light breaking on the ſides of the Glaſs, ſcattering ſome Species of the ſame Appearance towards the upper part of it. That upon the Repetition of the Experiment three or four times, the *Phoſphores* ſeem'd every time to be more Vivid than other, till at laſt, by often ſhaking the Quickſilver, its ſurface became ſomething ſolid, rendring the Light leſs then, than it had before. That in this, as well as in all other Mercurial Experiments, the Light Exhibited is of a very pale Colour. That the firſt Appearance of this Light, is, when about half the Air contain'd in the Recipient is exhauſted, which ſtill encreaſes with the Rarefaction ; And Confirms with all the reſt, the Neceſſity of a Rarefy'd Air to ſuch a degree, to Produce the Mercurial *Phoſphore*, concurring with that made by the Motion of the Quickſilver in the Weather-glaſs.

Experiment V.

Shewing very odd Flaſhes of Light, upon the Repetition of the Experiment, reſembling a Shower of Fire.

THe Account already given of this Experiment, ſo far as occurr'd at the firſt time of making, leaves me but little room to add more. However, altho but little. 'tis too deſerving to paſs it by in ſilence : The Appearance of it being not only very ſurprizing, but Diſtinguiſhably the Cleareſt and moſt Vivid Light in all the Mercurial *Phoſphori*, Produc'd in Rarefy'd Air. The Deſcription of the Receiver, Included Glaſs, and Funnel, being before given, I ſhall directly proceed to my farther Obſervations on the Experiperiment. Upon the Repetition of which, the Mercury did not only appear as a Shower of Fire, but from the Crown of the Included Glaſs were darted frequently Flaſhes reſembling Lightning, of a very pale Colour, very diſtinguiſhable from the reſt of the Light produc'd. The Flaſhes ſeem'd then to be darted Horizontally, altho at other times I have obſerv'd them to incline upwards, and ſometimes downwards, ſometimes from divers parts, as well from the outward Receiver, as Included Glaſs. Sometimes they would be thrown in a figure ſo odd, that I have no Idea of any Compariſon. I have likewiſe obſerv'd them to proceed directly from the ſtream of Quickſilver, as it deſcended from the Funnel, before it reach'd the included Glaſs. They generally fly to the ſide of the outward Receiver, (unleſs their Origin begins there, as ſometimes I have obſerv'd) where the Light breaks, and ſpreads in a very odd form. Something farther obſervable was, That the Crown of the Included Glaſs appeared ſenſibly more Luminous than any other part of it ; which Light was Conſtant without Alteration, during the Deſcent of the Mercury through the Funnel, and that was at leaſt two minutes of time. The Quantity of Mercury us'd for this Experiment was about 3 *l.*

Experiment VI.

Shewing that Abundance of Particles of Light are diſcoverable, by ſhaking Quickſilver in a Glaſs even in the Open Air.

THe Title of this Experiment, at firſt ſight, would ſeem to Contradict the Accounts given of all the foregoing Experiments, relating to the Production of the Mercurial *Phoſphore :* In ſome of which I aſſert that the *Phoſphore* of Quickſilver is not produceable but in ſuch a *Medium* ; now there I would be underſtood, A Light of the ſame nature and quality of that diſcover'd in the Barometer, by putting the Mercury in Motion : Which Light is very different from what is made by ſhaking Mercury in the Open Air, as was very ſenſible at the making of this Experiment. For, having put into a clean Glaſs Globe, (whoſe Content was equal to about 30 ounces of Water) about half a pound of pure Quickſilver, then cloſing the mouth of it with a Braſs Cap, in whoſe middle was inſerted a Cock, by means of which a liberty was given for a free Communication with the Outward Air: Thus prepared, the Globe was ſhaken, and the Particles of Light appear'd plentifully, about the bigneſs of ſmall Pins heads, very vivid, reſembling bright twinkling Stars, exhibiting ſome ſmall faint Light, like the whitiſh Appearance of the *Via Lactea*. Their Number increas'd according to the Rapidity of the Motion given. This being the whole product of the Experiment in the Open Air, I then took the ſame Glaſs, with the ſame Mercury, and apply'd it to the Pump, by means of a hollow Braſs Pipe, which ſcrew'd both to the Cock and Pump (in manner of *Fig.* 4.) The Air from within which being withdrawn, and the Cock turn'd, to prevent its getting in again, it was taken off, and moderately ſhaken; the Mercury then did appear Luminous all round, not as before, like little bright Sparks, but as a Continu'd Circle of Light during that motion: But when that Motion was check'd with another of greater Violence, it then appear'd Luminous almoſt all over the Globe. Upon ſuffering the Air to return, that mode of Light vaniſh'd, nor could any thing be Recover'd by ſhaking, but only the bright Sparks, as at firſt.

IV. *An Account of ſome Magnetical Experiments and Obſervations. By* W. Derham, *Rector of* Upminſter *in* Eſſex, *and F. R. S.*

HAving lately invented an *Azimuth-Compaſs*, as I was preparing it for obſerving the *Magnetick Variation*, I took occaſion, in ſome leiſure hours, to try divers Magnetick Experiments for my diverſion; and by that means happened upon this odd *Phænomenon.*

Having touched a piece of Wire, ſo that it ſtrongly tended N. and S., I was minded to ſee whether it would have any Inclination to either of the Poles of the World, when turned round like a Ring, ſo that the two ends of the Wire met. And having again ſtraitened it, I was ſurprized to find it had quite loſt its *Verticity.* The cauſe of which I preſently concluded to be the Contact of the Northern and Southern ends of the Wire, which I thought might ſo influence one the other, as to confuſe its Poles; although I confeſs I had never obſerved any ſuch Confuſion to ariſe upon the bare contact of the Northern and Southern ends of two other touched pieces of Wire.

Upon this I touched ſtrongly the ſame, and other pieces of freſh Iron Wire, and having found them all greedily to turn N. and S. I coyled them round ſo as that the ends ſhould not come near one another, and again ſpeedily opened them ſtrait; and found, as before, that every piece had utterly loſt its *Verticity*: Nay, the *Magnetick Virtue* was ſo abſolutely deſtroyed by bending the Wire, that it had not only loſt its Inclination to either Pole, but the two ends of each Wire ſeemed indifferent to the Poles of the *Load-*

Loadſtone, *viz.* whereas before the bending, the adverſe Poles of the *Loadſtone* would repel, and the Similar Poles attract the adverſe, or Similar ends of the Wire: Now the repulſive Virtue was quite extinguiſhed, and either end would indifferently be attracted by either Pole of the Magnet; all one as if the Wire had been heated red hot (which is well known to deſtroy the Virtue) or never had been touched at all.

This I experimented over and over again upon Wires of different lengths, with the ſame ſucceſs. Only this muſt be obſerved, if you only bend the Wire round, ſo as that it ſhall ſpring back into its place, or recoil, ſo as to be near the ſame ſtraitneſs, that then no ſuch, or but little of ſuch effect, will enſue. But to produce this effect, the Wire muſt be *ſharply* bent, ſo as that *violence* may be exerted upon it. If it be coyled two or three times round a ſmall round Stick, it will beſt ſucceed. And farther alſo, it is neceſſary that every part of the Wire ſhould be bent, to evacuate the Magnetick Virtue: For if the ends, or any other part happen not to ſuffer the violence of bending, that part ſhall retain its Magnetiſm. As for inſtance, if the Wire be all coyled, except half an inch, or indeed half a tenth of an inch at each end, every part ſo coyled ſhall both loſe its Verticity, and ſhall incline indifferently to either Pole of the Magnet; but the two ends, (although not able to turn the whole Wire N. and S.) ſhall fly from, or tend unto the reſpective Pole of the Magnet: Or if every part of the Wire be coyled, except a ſmall bit at one end only, all that coyled part, when extended, ſhall utterly be deprived of its Magnetiſm as before; and only that uncoyled bit retain its averſion, or inclination to the Magnetick Poles.

From the conſideration of all which particulars, it is very manifeſt, that the violence exerted upon the Wire by bending doth utterly extirpate the Magnetick Virtue, or at leaſt make ſuch a confuſion therein, that it is as if wholly deſtroyed: Which being a caſe ſo very odd, and never (that I have ever met with) taken notice of before, I have thought it a part of my Duty I owe to this ingenious and learned *Society*, to acquaint you with it; hoping it may give ſome lucky hint to ſome Ingenious Perſon, for the better diſcovery of that intricate ſubject, concerning the Nature of Magnetick Bodies.

VII. *Farther Obſervations and Remarks on the ſame Subject.*

I Lately gave the Society an account of the *Deſtruction of the Magnetick Virtue* in a touched piece of Iron Wire, by *Bending*, or *Coyling round*: Which I thought had been a Novelty. But by looking over more accurately what others have written of Magneticks, I find in *Grimaldi de Lumine* and *Colore*, that he, and in our *Phil. Tranſactions*, N. 188, that *Mr de la Hire* had hit upon the ſame diſcovery before me. However, they having not proſecuted their Diſcovery ſo far as I did, and my account containing divers things not taken notice of by them, I hope what I ſent the Society was not unacceptable.

And indeed it is very happy for me that I have the Authority of ſo Ingenious Perſons on my ſide, becauſe the Experiment not ſucceeding in ſome tryals ſince, I have had reaſon to fear leſt the Society might call my Integrity in queſtion.

The matter of fact was thus, and to me ſurprizing: I touched and coyled ſeveral Iron Wires, but the effect that enſued was not ſuch as I told the Society. The Verticity was indeed much weakened, but not totally deſtroyed, and the ends of the Wires would be attracted or repelled by the Poles of the Magnet; whereas I ſaid they uſed only to be attracted. The next morning I tryed again: And then the Magnetiſm of the Wires was totally deſtroyed, as I related to the Society. This Experiment I repeated divers times, and on divers Wires this Winter, and commonly find, that, all the day, coyling will evacuate the Magnetiſm: But that it will not abſolutely do it in the Evenings. But whether it will do ſo in Summer, or all Weathers, or whether it ſucceedeth thus only in different times of the Day, I muſt leave to farther Tryals. I well know that the Orb of the Activity of Magnets, is larger, or leſs, at different times. That noble Magnet in the Society's Repoſitory found in *Devonſhire* by Dr *Cotton*, is known in ſome Weathers (or at ſome times) to keep a Key, or other piece of Iron, ſuſpended to another Iron at 8, 9 or 10 foot diſtance. But at other times, the Iron will drop down at the diſtance of 3 or 4 foot from the Magnet. If I lived nearer, I would obſerve the *Phænomenon* more nicely: Particularly whether there be any difference therein in the Evening, and the reſt of the Day. Now whether at all, or how far this may reach the forementioned caſe, I cannot ſay, not having as yet ſufficiently experimented the matter.

Finding the caſe thus with *Coyled*, or *Bent Wire*, I was minded to try the event of *Twiſting* of Iron Wire from end to end, after it had been well Touched. The Succeſs was, The *Verticity* was always weakened, and ſometimes inverted. And when it was ſo, the Load-ſtone did accordingly commonly Repel or Attract, all one as if the Twiſting the Wire had given a new Touch the contrary way.

But in ſome Wires ſo twiſted, the Verticity was wholly deſtroyed, or rather much confuſed. For I found by drawing one of the Poles of the Loadſtone along near the ſides of the Wire, that in ſome places it would Attract, in others Repel, and ſo attract and repel all along the Wire. Nay,

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I fancied in ſome places, that one ſide of the Wire would be attracted, the other repelled by one and the ſame Pole of the Loadſtone.

To theſe odd changes, I could add divers others, which the *Twiſting* produced. But theſe do ſufficiently ſhew that the Magnetick Virtue is put into great confuſion by the Violence exerted upon the Wire by *Twiſting*: Which not only ſeparateth the fibres of the Iron (as may be ſeen with the Eye, eſpecially aſſiſted with a Microſcope) but alſo changeth their Situation from Longways to Skrew-ways.

This being the Succeſs of *Twiſting*, I was next minded to try what would be the iſſue of *Splitting* or *Cleaving* touched Wires: Particularly whether they would exert the ſame effects that Magnets are ſaid to do, when ſawn in two Meridionally. Concerning which Dr *Ridley* ſaith, “Cut a piece from a Magnet ſtone Meridionally, and that end which was placed S. when it was whole, being ſevered, will turn North, although naturally at firſt it was the S. point. But Mr *Barlow* (who ſeems to have been a more judicious and faithful Author, is of a contrary mind, and ſaith, That the Poles of ſuch a piece of Magnet, when ſevered, will abhor the ſame Poles, to which it grew in the whole Magnet. But he ſubjoyns, “But here you muſt beware of an error, which ſome unhappily have entangled themſelves withal, who beholding the aforementioned diſcord, wrongfully ſuppoſed, that if both theſe Magnets the greater and the leſs [*i. e.* the piece cut off] were conveniently placed to ſwim in Water, the little one would not with his end point unto the South of the Earth as it did in the Magnet being entire, when it was a part of the true North-end, but would point contrarily. There is (ſaith he) no manner of any ſuch alteration, but that both the great one, the little one, (and all the like, that are cut Meridionally one from another) will abſolutely point the very ſame way which the entire one did. Only the Meridian will be ſomewhat removed, *&c.*

Treat. of Magnet. Bodies and Motions. Ch. 9.

Magnet. Advertiſements. Ch. 2.

Dr *Gilbert* (whoſe Judgment and Fidelity is not to be queſtioned) is as expreſs as his Friend Mr *Barlow*. For (*L.* 2. *c.* 5.) ſpeaking of a Magnet divided, and ſhewing how that the parts which in the whole Stone coaleſced, do by Separation repel one another, he ſaith, *That what was the N. and S. Pole before, is ſuch ſtill.* ***Non enim*** (ſaith he) *immutatur Verticitas (quod malè affirmat B. Porta.) Nam licet [Poli ſeparati] non conveniunt, ut alter ad alterum inclinaret; tamen uterque in idem horizontis punctum convertuntur.*

How the Truth lieth between Dr *Ridley* and the two later Authors I cannot determine, having never ſo cut a Magnet. But by the Magnetick Laws, as well as from the Authority of Dr *Gilbert* and Mr *Barlow*, I doubt not but the later is the trueſt opinion.

But in *Cleft Wires* the caſe is very uncouth. Oftentimes the Poles are quite changed: So that what was the *North*, becometh the *South* Pole of the Wire in all reſpects; I mean, not only turning, but alſo embracing, or avoiding the Poles of the Loadſtone, as if it had received a new, and contrary Touch. Sometimes one half of the Wire will retain its Magnetiſm, which it had before ſplitting, and the other half have it quite changed. Sometimes no change at all will enſue, only the Magnetiſm be much weakened; as indeed it always is in all the Experiments where the Wire is ſplit. (But generally, where one of the halves hath ſuffered change, the other not, I have obſerved, That 'tis the thinneſt and weakeſt that hath been changed, and the thickeſt hath retained its Touch.) Sometimes where one of the Split Halves receiveth an *inverted Verticity*, or ſeemeth to have no Verticity at all, one of its Ends will incline to one of the Poles of the Magnet, not according to its Touch, but in an inverted order, and the other end be attracted indifferently by both the Poles of the Loadſtone. And in ſome caſes, that End ſhall be attracted by one Pole, but be neither attracted nor repelled by the other; but ſtand as it were heſitating whether it had beſt fly to, or from that Pole of the Loadſtone. Only if that Pole of the Magnet be too near, then that end of the Wire will conſtantly fly thereto: As indeed it is the nature of all Magnets and Magnetick Bodies to do, when they touch, or approach very near one another, tho they repelled before.

The Cauſe of theſe great Changes in touched Wire produced by *Splitting*, I have ſometimes imagined to ariſe from the Violence exerted thereon by Bending. But in ſome Wires that I ſplit, or cleft with very little bending, one Half hath been utterly changed, the other not. In others that I cleft, by ſuffering the Halves to bend as much as they would, no change hath been; and ſome have quite ſuffered change.

Sometimes I have imagined that the Splitting the Wires in a N. or S. poſition, or that the beginning to ſplit at the N. or S. end of the Wire firſt, might be the cauſe of this contraverſion of the Poles. But tryals ſhewed there was little in any of this.

Thus I would have done with *Split* or *Cleft Wires*; but there is one thing very ſurprizing, which will deſerve to be mentioned, *viz. That the laying one, or the other ſide of the Half uppermoſt*, will cauſe a great alteration in its Tendency, or Averſion to the Poles of the Magnet (as I have ſaid.) But if you lay the contrary ſide of that Half uppermoſt, the ſame End ſhall be attracted by one, and repelled by the other Pole of the Magnet. In other pieces, where the Ends are regularly attracted or repelled, only in an inverted order (as if new touched,) if it lay with the round ſide uppermoſt at that time, and be then turned upſide down, *viz.* the flat cleft ſide uppermoſt, 'tis ten to one if one of the Ends be not either attracted by both the Poles, or repelled by both; or elſe attracted or repelled by one, and heſitates as to the other: For ſo it often befalls.

The Cauſe of this lubricity of the Magnetiſm, I imagined might be, becauſe the ſides or edges of the Wire had received contrary Poles by Splitting: And conſequently were turned topſy-turvy, that what was the N. might then be the S. edge of the Half. But I could never diſcover, but that the ſides of each end, or of any other part, were the ſame, when I held the Loadſtone to one or the other ſide. Which indeed I always did in every Experiment for greater certainty ſake.

My Hand being thus in, I was minded to repeat the old Experiment of Touching Wires, *by rubbing them backwards and forwards* with one of the Poles of the Loadſtone, becauſe it might probably give ſome Light into the aforementioned ſtrange *Phænomena*.

Mr *Barlow* was I think the firſt (at leaſt he ſaith he was) that diſcovered the error of this way of Touching, *viz.* That it weakeneth or much hurteth the Touch. This I tryed, and found what is ſaid, not only to be true, but alſo that the Reaſon thereof is, *Becauſe the Poles of the Wire, or Needle, ſo touched, are not at the Ends, but in, or near the Middle of the Wire or Needle.* Sometimes one is near the Center, the other at one or both Ends. For in ſome Wires ſo touched, both the Ends of the Wire would be Attracted by one Pole of the Loadſtone, and Repelled by the other. And in ſuch caſe the Repelling Pole always found a Sympathetick part near the Center of the Wire. In others (eſpecially where a Verticity ſucceeded, as ſometimes it will do, and that pretty ſtrongly too, in ſuch a caſe) the Verticity would be inverted, and the Ends of the Wire be attracted and repelled in a direct contrary manner to the Natural Form. And the Reaſon of all this will be manifeſt from theſe following Experiments.

I touched a Wire from end to end with only one Pole of the Magnet. This gave ſo vigorous a Touch, that I am almoſt of opinion, *It is the beſt way of Touching.* The Conſequence was, The End where I began always turned contrary to the Pole that touched it. I again touched the ſame Wire, and others too with the other Pole of the Magnet, from the ſame end, and then that end turned the contrary way. *E. G.* Mark one end of a Wire for the North-end, and Touch that Wire, by drawing the N. Pole of the Magnet divers times along the Wire from the N. to the S. end: This Wire ſo touched ſhall have a vigorous Verticity; but the North-end ſhall ſtand South. But if you touch that or another Wire, (for it is all one, becauſe the Latter deſtroys the Former Touch; I ſay, if you Touch) by drawing the N-Pole of the Magnet from the S. the N-end of the Wire, then this N-end will turn N. And ſo it will do the ſame, if you Touch with the Southern Pole from the N. to the S.

Laſtly, There is one Experiment more doth yet give farther light into what goeth before, *viz.* I touched an Iron Wire exactly in the middle with only one Pole of the Loadſtone, without drawing it backwards or forwards. The Event was, That in that place that Pole of the Wire was, and the two Ends were the contrary Pole of the Wire; and were accordingly Repelled or Attracted by the Poles of the Loadſtone: And the Middle, and an inch or more on each ſide was attracted by the Pole only that Touched it.

And now, if we reflect upon what hath been ſaid, and compare the foregoing Experiments one with another, they not only illuſtrate one another, but ſeem to lay open a fair way towards the diſcovery of a great many of the intricate *Phænomena* of Magneticks. And therefore, beſides the Novelty, their Uſefulneſs may, I hope, render theſe Experiments and Obſervations acceptable to this Illuſtrious Society.

VIII. *A Letter from Mr* Ralph Thoresby, *F. R. S. concerning a* Roman *Inſcription lately found at* York, &c.

THE *Roman* Monument lately diſcovered at *York* (which you deſire an account of) was found in digging a Cellar in *Coning-ſtreet*, not far from the *Roman* Wall and Multangular Tower, that Dr *Liſter* has given ſo curious and particular a Deſcription of. This Monument, Dedicated to the *Genius*, or Tutelar Deity of the Place, is not of that courſe Rag, that the generality of the *Roman* Monuments are, but of the finer Gritt, like the Altar at the Lord *Fairfax*'s Houſe in *York*: 'Tis 21 inches long, and 11 broad, and is inſcribed GENIO LOCI FELICITER. There was a larger Stone found with it, but without any Inſcription; nor is there upon either of them the repreſentation of a Serpent, or a young Viſage, by both which the Ancients ſometimes deſcribed theſe *Dij Topici*; if the Name had been added, it would have gratified the Curioſity of the *Neoteric* Antiquaries; but they muſt yet acquieſce (for ought I know) in the old DVI, who is ſaid to be the *Tutelar Deity* of the *City* of the *Brigantes*; from which *Diw*, as the *Britains* call'd him, *Dewsbury*, or *Duisburg* in this Neighbourhood, ſeems to have receiv'd its name; a place now chiefly noted for a ſort of courſe Cloath there made, and thence called *Duberians*: The Monument is of this form.

Phil. Tranſ. No 149

Camdens Bri- *N. E. p.* 708.

The

GENIO LOCI
FELICITER

The Author of this *Votive* Monument ſeems to have had the ſame Superſtitious Veneration for the *Genius* of *York*, as thoſe at *Rome* had for theirs, whoſe Name they were prohibited to utter, or enquire after; hence it is upon their Coins the Name of this Deity is never expreſſed, but in a more general manner by *Genius* P. *R.* or *Pop. Rom.* Such a one I have of *Conſtantius*, minted at *London*, as appears by the Exurg L O N. under the Effigies of that Deity, with a *Patera* in the Right Hand, and *Cornucopia* in the Left, inſcribed GENIO POPULI ROMANI. I rather inſtance in that of this Emperor (the Father of *Conſtantine* the *Great*) becauſe he made *York* his Imperial Seat, and was here Deifyed; the Medal of whoſe *Apotheoſis* I alſo have, minted at the ſame place and inſcribed MEMORIA FELIX. which I mention (tho nothing relating to the Genius) becauſe of the expreſſion of a noted Antiquary, "That *Rome* in the height of its "greatneſs, had not a more glorious and gallant ſhow "to exhibit, than what this poor piece of Copper would "expreſs. As the *Genius* of the *City of Rome* was expreſſed by G. P. R. ſo that of the *Commonwealth*, in a moſt ſordid Flattery, by that of the *Emperor*, who they pretended to be their *Happy Genius*. I have one even of *Nero*, and not only after his *Quinquennium*, but the year

Burton's Com. upon Anton. Itin. p. 78.

year after he had laid moſt of the City in Aſhes, yet by the expreſs order of the Senate, inſcribed GENIO AUGUSTI. S. C. Some of the Fathers have therefore juſtly reproach'd the *Romans*, for paying a greater Veneration to the *Genii* of their Emperors, than to *Jupiter* then ſupream God. This Cuſtom of Deifying the *Genii*, and that of aſſigning *Gods* for defence of particular Cities, is very ancient, as appears by what the Prophet *Jeremiah* ſaith of revolting *Judah*, *According to the number of thy Cities are thy Gods*; after the manner of the Heathen, who, according to *Varro*, had above * thirty thouſand; and yet notwithſtanding this prodigious number, it is evident from their Medals, that ſeveral Cities were ſometimes aſſigned to the ſame Tutelar Deity; thus the *Greeks* (from whom the *Romans* receiv'd this and ſeveral other of their Superſtitions) committed both *Magneſia* and *Smyrna* to the protection of *Cybele*. Medals of the former are more common, of the latter more rare. His Excellency Baron *Spanheim* has writ a moſt Learned Diſcourſe upon them, which makes me more to value one in my poor *Muſæum*, which has the Effigies of that *Mother of the Gods* with her Towered Head, and CMYPNA; upon the Reverſe is a Lyon Paſſant with CMYPNAIΩN. I have alſo a large curious Medal of *Julius Philippus*, that would tempt us to believe that *Antioch* alſo was devoted to the ſame *Cybele*, for it has round her Head with the Turreted Crown ANTIOKEΩN MHTPOKOΛΩN. with Δ (or rather Λ) E and S C on each ſide the Head. I muſt own my ſelf ſomewhat at a loſs about the latter word, except the *Greek* and *Roman* Tongues began then to admit of a ſort of Mongril Mixture, ſo that from MHTEP and *Colonus*, might proceed MHTPOKOΛΩNΩN, and ſo the *Antiochians* have the Title of the Men of the Mother-Colony,

Jer. 2. 28. *and* 11. 13.

* *Pool's Synopſis Critic. in loc.*

Colony, the Λ Ε which are *Greek*, the S C in *Latin* Characters, the former ſignifying *Luſtrum Quintum*, the other *Senatus Conſulto*, ſeem to countenance this Conjecture, the *Roman* S being different from that in ΦΙΛΙΠΠΟC and C E Βας'ος upon the ſame Coin.

This Curioſity of the City of *Antioch* is not ſo valuable as it was the Metropolis of all *Syria*, and highly applauded by *Ammianus Marcellinus* (who lived within a a hundred years of this time, as it is becauſe here the name of *Chriſtians* was firſt taken up, and that St *Paul* both preached and kept a Synod here, as *Euſebius* tells us, and ſo another I have of *Antoninus Pius*, inſcribed ΒΕΡΟΙΑΙΩΝ, which is more valuable in my Fancy for that paſſage *Acts* XVII. 2. than if it could be certainly aſcribed to the nobleſt of the four Cities that bore the ſame Name.

IX. *An Account of ſome* Roman *Coyns found at* Clifton *near* Edlington *in* Yorkſhire. *By Mr* Ralph Thoresby, *F. R. S.*

I Take my ſelf obliged to give you an account of the diſcovery of ſome *Roman* Coins, lately found at *Clifton*, near *Edlington*, the Seat of the Honoured and Obliging *Robert Moleſworth* Eſq; from whom I have receiv'd a Noble Preſent of them; which is the more valuable, becauſe by his Ingenuity they are ſo artificially cleared from the Ruſt they had contracted by lying ſo many Centuries in the Earth, that they appear little inferiour to what they were when firſt Minted: They were dug up at the Eaſt Entrance of *Clifton* (a Village on the Cliff of the Hill) three miles from *Doncaſter*, the *Roman Danum*, where the *Præfectus Equitum Criſpianorum* reſided, and one from *Cunsbrough*, or *Coningsburgh*, an Ancient Seat of the Kings during the *Saxon* Heptarchy, now belonging to Mr *Cook* of *Norfolk*. They were found ſo near a Highway, that the Cart-tracks had worn the Earth off the top of the *Urn*, which a Labourer of Mr *Moleſworth*'s ſtruck his Pick-Ax into, before he was aware of it: Upon another ſearch, they found another *Theca Nummaria*, both full of Copper Coin; the haſte and ſcramble of the Workmen to get the ſuppoſed Booty (which they hoped might prove as valuable as the Broad Gold found at *Kighley*) made them break in pieces both the Urns, which were large and entire; the bigger of them might contain two gallons: By the fragments of them they appear to have been of a

finer

finer Clay than thoſe found at *South Holland* in *Lincolnſhire*, mentioned in the *Phil. Tranſ.* No 279, and the Coins alſo much better preſerved, being in a dryer Soil. Of ſixty I bought of thoſe found at *Fleet* com. *Linc.* there was not one before *Gallienus*, nor after *Quintillus*; and of near 150 of theſe from *Clifton*, there is not one of an elder or later date; ſo that both thoſe in *Holland* and theſe in *Yorkſhire*, ſeem to have been hid in ſome common Calamity that followed the Death of that ſhort-liv'd Emperor *Quintillus*, who reigned but ſeventeen days, *An. Dom.* 271. And within ſix years after, we find that *Probus* the Emperor, upon ſome Commotions in *Britain*, ſent over certain *Vandals* and *Burgundians*, who had invaded *Gaul*, to inhabit *Britain*; upon whoſe arrival, probably ſuch as had made the Inſurrection, might conceal their Treaſure; and being ſlain in the Conflict, it lay hid till now. This I look upon as a more probable Conjecture, than the Perſecution of *Diocleſian*, which was not till thirty four years after. Theſe, tho they have not added one Emperor to my Collection, yet have they made a very conſiderable addition to the Variety of Reverſes; ſo that I have above thirty of *Gallienus*. But not to trouble you with any I had before (as VICTORIA GERMANICA. VIRTVS GALLIENI AVG. GERMANICVS MAXV. *&c.*) I ſhall only preſent you with a liſt of ſuch as were found at *Clifton*. So far as are in Capital Letters are upon the Coyns, the reſt are only for explanation.

Reverſes of *Gallienus*.

SECVRITas PERPETua. PAX AVGuſti. APOLLINI CONServatori AVGuſti. PVDICitia. LAETITIA. AEQVITAS AVG. AETERNITAS AVG.

LIBEro Patri CONS. AVG. DIANAE CONS. AVG. MARTI PACIFERO. ..:.. P. VII. COS. (Pietas libans) ....S. STATOR; which I take for *Mars*, who is ſometimes ſo ſtiled as well as *Jupiter*. VICTORIA AETERna. CONCORdia.

Salonina. Reverſe VESTA.

Poſthumus. PAX AVG. P. M. TR P. COS. V. which I take to be remarkable, having not met with any more than the 4th Conſulſhip.

Victorinus. INVICTVS (*typus Solis vel Apollinis*) VIRTVS AVG. PAX. AVG. SALVS AVG. PIETAS AVG.

Tetricus the Father. SALVS AVG. PAX AVG. HILARITAS AVG. VICTORIA AVG. FIDES MILITVM. LAETITIA AVG. SPES PVBLICA. COMES. VIRTVS AVG. COMES AVG.

Tetricus Cæſar. SPES PVBLICA. SPES AVGG. PIETAS AVGGuſtorum.

Claudius. GENIVS EXERCI. LIBERALITAS AVG. VIRTVS AVG. VICTORIA AVG. PAX AVG. FELICITas TEMPoris. AEQVITAS AVG. IOVI VICTORI.

Quintillus. PROVIDENTIA AVG. VIRTVS AVG.

X. *An Accouut of a Book, Entituled,* Joh. Conradi Beckeri, *Phil. & Med. D. Tractus Alsfeld. Medici Ordin. Paradoxum Medico-Legale de ſubmerſorum Morte ſine pota Aqua, aliquot Cadaverum ſectionibus detectum, & e principiis mechanicis illuſtratum. Cui adjicitur Dodecas Obſervationum circumſtantiis curaq; rariſſimarum.* Gieſſæ-Haſſorum, A. MDCCIV.

THis Author having made ſeveral Experiments about Drowning, and being diſſatisfied with the various Opinions that were held concerning it, was induced to write this preſent Treatiſe, in which he relates theſe following Caſes, as Matters of Fact.

Having catch'd a Cat, (ſays he) and deſigning to make ſome ſport with her, I took a Board with a hole in the middle, and putting the Tail through, I faſtned her very well to it, then put her afloat into the River, and by a String held the Board from being carried down by the rapidity of the Stream; afterwards I ſent in a well mettled Cur after her, who made very pleaſant ſport; but the Dog being tired with worrying of the Cat, was ſuckt into a Whirlpit, ſunk down, and never came up again alive. By the help of a Boat, after an hours ſearch for him, we found him, and then carried him home to Diſſect him. The *Abdomen* appeared to be a little extended, as did likewiſe the Stomach and Inteſtines in a ſmall meaſure; but that which was the greateſt cauſe of our wonder, there was no Water found in either of them. The Lungs were likewiſe extended, but in no greater a degree than the Stomach or Inteſtines, and lookt exactly as thoſe do in Dogs that are hang'd. We made an Inciſion into the *Trachæa*, whereupon they ſank down immediately. This at firſt made a great noiſe, the Phyſicians were amaz'd at it, and, in ſhort, every one much wondred how a Dog could be drowned without Water. This our Author tells us was the firſt occaſion of his diſſenting from the Antients in Caſes of Drowning.

The next Obſervation he gives us, is of a Countryman, who having been miſſing for ſome weeks, was afterwards found drowned in a very ſhallow place. The Body being clean'd from Mud, ſome Livid Spots appear'd externally, tho we could not perceive any violence had been uſed: Then we proceeded to open the *Abdomen* and *Thorax*; in the *Abdomen* the Inteſtines appeared to be full, after we had tyed up the *Gula* and *Duodenum*, that we might more eaſily judge of the Contents of the Stomach, we took it out, and by the weight of it judged there muſt needs be a very conſiderable quantity of Water in it; neither were we miſtaken in the quantity, but upon cutting into it, it appear'd to be the Liquor he had been too freely drinking of; we thought there might be much about the ſame quantity in the Lungs, by reaſon of their great extenſion; but it happen'd we were out in our gueſſing, for no ſooner did we cut into the *Trachæa*, but the Wind ruſhed out, and the Lungs ſunk down that very moment. Now had I perceived that any violence had been uſed, I ſhould certainly have concluded that the Perſon had been killed, and after he was dead was thrown into the River; but we underſtood by ſome preſent with us, who told us, that they ſaw the Deceaſed at a Fair very much in drink (which was the laſt time that ever he was ſeen alive) and fancied, that in paſſing over that River (which he could not avoid) in his way home, he unfortunately fell in; and indeed the contents of his Stomach proved what they ſaid to be true. This Obſervation did not only throw down the *Hypotheſis* of the Antients, but made me believe that thoſe were in the wrong; who deny'd any perſon to be ſuffocated under Water, without they find a quantity in the Lungs or Stomach; it appear'd as certain as could be, that this perſon went into the Water alive, and yet there was no Water found either in the *Trachœa* or Subſtance of the Lungs. The Liquor he had been too freely drinking of an hour or two before he dyed ſhowed itſelf plainly in the Stomach and Inteſtines.

The next Subject the Author tells us of, was a Woman who unfortunately fell into a Well; after the Body was taken out there appeared ſeveral large Contuſions, there were two upon each Arm, about the breadth of two Fingers, but longer, which lookt as if they had been made with a Stick; the Blood was extravaſated between the *Os Bregmatis* and *Panniculus Carnoſus* on the Left Side. There were two Fiſſures on the *Os Frontis*, and one on each Orbit of the Eye. Under the *Pia Mater* of the Left Side we found ſome black Grumous Blood; the Stomach and Inteſtines were diſtended, which upon Inciſion ſunk down; the Lungs were cut into in ſeveral places, but not the leaſt drop of Water was found in them. Now if this Woman did tumble into the Water alive, it's plain ſhe dyed for want of Reſpiration; but if the Fall occaſion'd her Death, it proves thoſe to be miſtaken, who think that Water can get into the Paſſages after Death.

A man after 5 days ſearch was found ſtanding upright in the bottom of a Fiſh-pond; he was carefully taken out and viewed, and not the leaſt mark of any violence appeared. I my ſelf, with the aſſiſtance of a Surgeon, opened the *Thorax* and *Abdomen*; the Inteſtines were very much diſtended, and contained in them a whitiſh Liquor like Chyle: The Stomach was ſo ſwelled as induced the Spectators to think it was full of Water; we tyed up both the Orifices, and took it out, that we might more eaſily meaſure the Contents: It was ſo very light, that none but thoſe that handled it could ever have imagin'd it; afterwards we opened it, and a great blaſt of Wind ruſhing out, it ſunk down again immediately; neither was there any more than ſix ounces of a whitiſh Liquor in it. The Lungs were ſo diſtended with Wind as to fill up the whole Cavity of the *Thorax*; we prickt, and cut into them, but not a drop of Water came from them. The Man had the Character of a poor honeſt harmleſs Fellow, and therefore could not well be ſuſpected of being murder'd, and the poſture of his ſtanding made every one conclude that it was the darkneſs of the Night that occaſioned his loſing his Way and Life at the ſame time. And as we have all the reaſon in the World to believe that this perſon was ſtifled alive under Water, ſo we may ſee how fallacious that ſtanding Rule of the Antients is, who allowed no perſon to be drowned, without conſiderable quantities of Water, both in the Lungs, Stomach and Inteſtines.

After the Author hath given us theſe Experiments, he proceeds to anſwer the Objection that was made, of perſons recovering by being ſet upon their Heads; and afterwards to ſhow why it happens, that in drowned perſons the Water is ſeldom found either in the Lungs or Stomach. For which we refer you to the Book itſelf, containing beſides twelve uncommon Obſervations of different Caſes.

Printed by *Sam. Smith* and *Benj. Walford*, Printers to the Royal Society, at the *Princes Arms* in St *Paul's* Churchyard, 1706.

E R R A T A,

In *Philoſoph. Tranſact.* Numb. 302.

PAge 2077. line 21. read *explicâſſe ſibi.* line 25. r. *inde extra.* line 28. r. *legatus.* line 30. r. *indagator.*

BOOKS Printed for and Sold by Sam. Smith *and* Benj. Walford, *(Printers to the Royal Society) at the* Princes Arms *in St* Paul's *Church-yard.*

THe Poſthumous Works of *Robert Hooke*, M.D. S. R.S. Geom. Prof. Greſh. *&c.* Containing his Cutlerian Lectures and other Diſcourſes, read at the Meetings of the Illuſtrious Royal Society. In which, 1. The preſent Deficiency of Natural Philoſophy is diſcourſed of, with the Methods of rendring it more certain and beneficial. 2. The Nature, Motion and Effects of Light are treated of, particularly that of the Sun and Comets. 3. An Hypothetical Explication of Memory; how the Organs made uſe of by the Mind in its Operation may be Mechanically underſtood. 4. An Hypotheſis and Explication of the cauſe of Gravity, or Gravitation, Magnetiſm, *&c.* 5. Diſcourſes of Earthquakes, their Cauſes and Effects, and Hiſtories of ſeveral, to which are annext, Phyſical Explications of ſeveral of the Fables in *Ovid*'s *Metamorphoſes*, very different from other Mythologick Interpreters. 6. Lectures for improving Navigation and Aſtronomy with the Deſcriptions of ſeveral new and uſeful Inſtruments and Contrivances; the whole full of curious Diſquiſitions and Experiments. Illuſtrated with Sculptures. To theſe Diſcourſes is prefixt the Author's Life, giving an Account of his Studies and Employments, with an Enumeration of the many Experiments, Inſtruments, Contrivances and Inventions by him made and produced as Curator of Experiments to the Royal Society. Publiſhed by *Richard Waller*, R.S. Secr.

ΨΥΧΡΟΛΟΥΣΙ'Α: Or, The Hiſtory of Cold Bathing, both Antient and Modern. In 2 Parts. The firſt written by Sir *John Floyer*, of *Litchfield*, Kt. The ſecond Treating of the Genuine Uſe of Hot and Cold Baths, together with the wonderful Effects of the Bath-Water, drank hot from the Pump, in decay'd Stomachs, and in moſt Diſeaſes of the Bowels, Liver, Spleen, *&c.* Alſo proving, that the beſt Cures done by the Cold Baths, are lately obſerved to ariſe from the Temperate Uſe of the Hot Baths firſt. By Dr *Edward Baynard*, Fellow of the College of Phyſicians, *London.* The ſecond Edition, with large Additions, and a Copious Index.

BRITISH MUSEUM NATURAL HISTORY.

Tab: 1

Philos: Transact: N: 304

Fig: 3

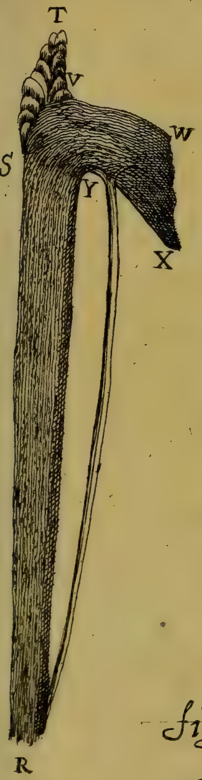
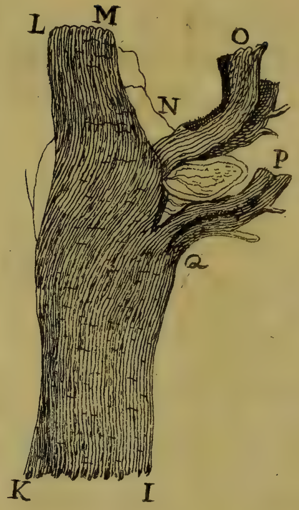


Fig: 2



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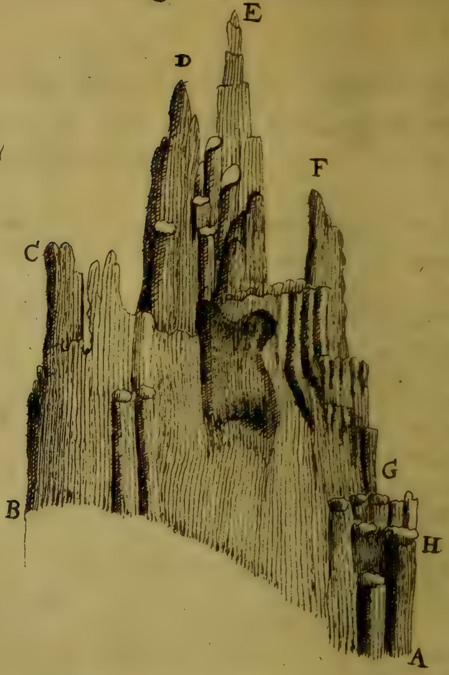

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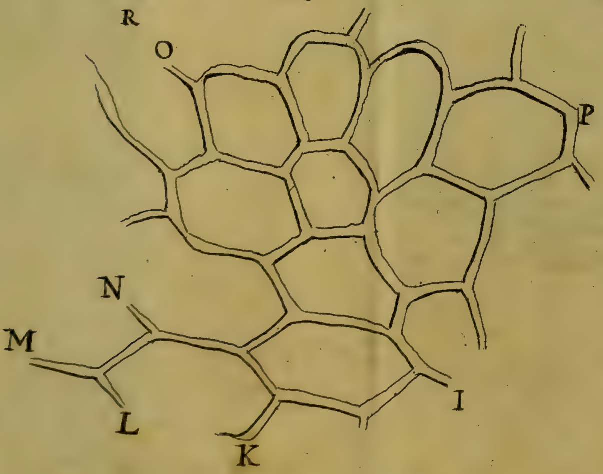

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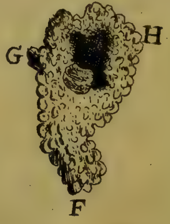

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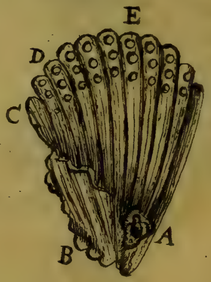

BRITISH MUSEUM NATURAL HISTORY.

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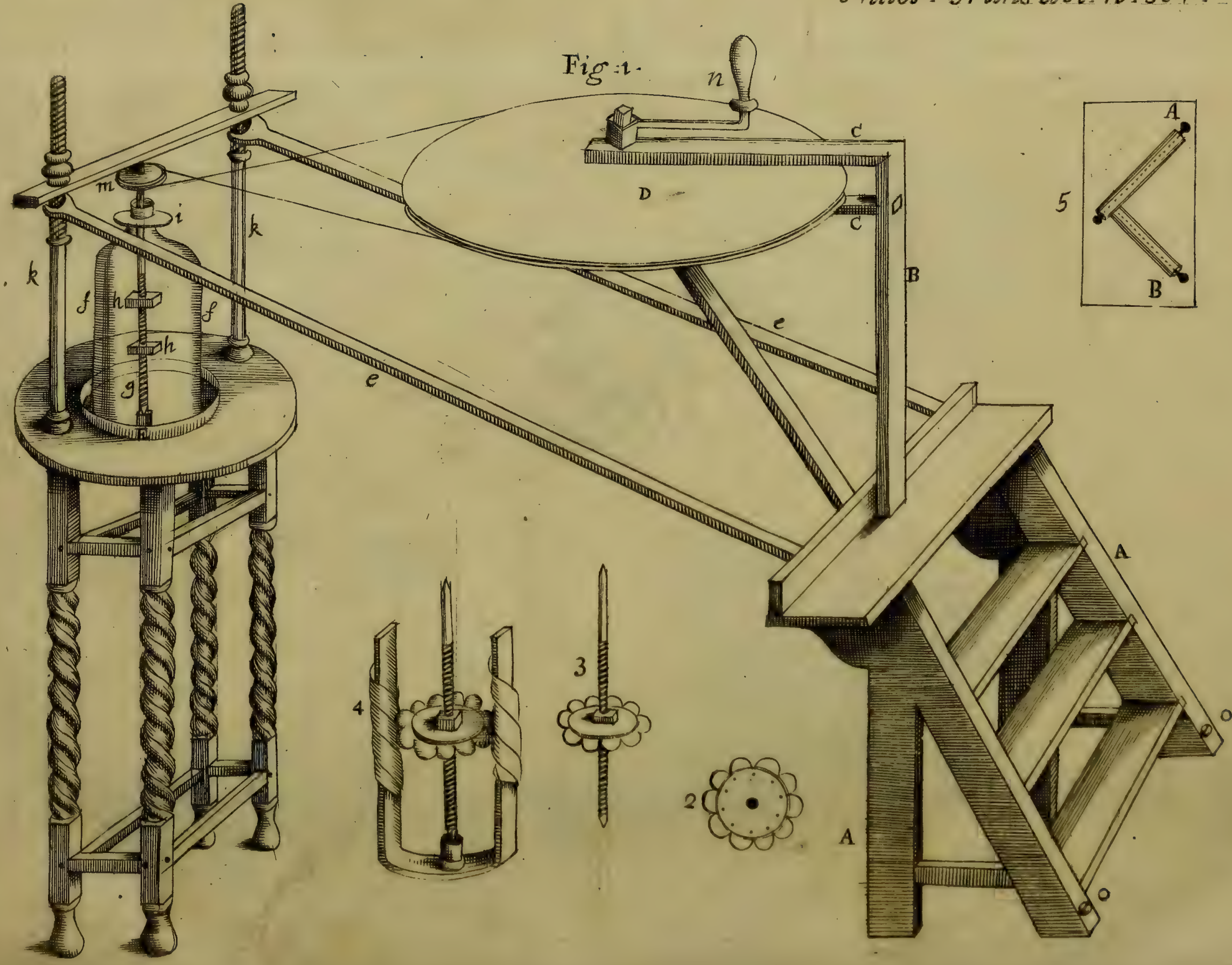

(Numb. 304.)

PHILOSOPHICAL TRANSACTIONS.

For the Months of November *and* December, 1705.

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I. *Several Microſcopical Obſervations on the Pumice-Stone, Coral, Spunges, &c. In a Letter from Mr* Anthony Van Leuwenhoek, *F. R. S.*

Delft, *December* 29, 1705.

I Have for ſome time made but few Obſervations; ſome of my Remarks made in the beginning of the Summer concerning the Pumice-ſtone, are as follows. I have ſeveral times heard ſay that that Stone which ſome People call *Dryf*, others *Pumice-ſtone*, which I have ſeen the Silver-ſmiths uſe for ſcouring their Hammers, wherewith they beat out their Silver, and which is likewiſe uſed by Hatters in their Trade, that the ſaid Pumice-ſtone is found driving in the Sea, and that the occaſion of its lightneſs is, that it is calcined by the Fire before it is thrown out of the Burning Mountains, after ſuch a manner as to fit it for ſwimming on the top of the Water.

I have oftentimes obſerved this Stone, but could never conceive that the Cavities which are found between the parts thereof (excepting thoſe exceeding ſmall Tubes or Pipes, ſome of which appear to be hollow) could be occaſioned by Fire.

For if it were true, that ſuch Stones were thrown out of the Volcano's, or Burning Mountains, very high into the Air, for inſtance, 200 Rods, according to all appearance, they would be red hot.

This being granted, let us ſuppoſe likewiſe that theſe glowing Stones will be four Seconds of a minute in riſing to ſuch a height, and four more ſeconds a falling into the Sea; in which time, according to our Hypotheſis, it would be impoſſible for the Stones to be cold; from whence it would follow, that being all hot when they fell into the Sea, they muſt neceſſarily ſink; for it is certain that the Heat cannot come into the cavities of the ſmall Pipes without driving the Air out of them, now there being no Common Air in thoſe Pipes while the Stones are glowing hot, and the ſaid Stones falling immediately into the Sea, the Heat is expell'd by the Water, which inſinuates itſelf preſently into thoſe Cavities, and conſequently the Pumice-ſtone having its Pipes filled therewith, will ſink down to the bottom, and not riſe to the Superficies of the Water.

That this is ſo, we may be entirely ſatisfy'd if we take a piece of Wood-coal, that has been damp'd or extinguiſhed, and throw it into the Water, we ſhall ſee how high it will riſe, by reaſon of its lightneſs, above the Superficies thereof.

This piece of extinguiſhed Coal being thrown into the Fire till it becomes red hot, all its Tubes or Pipes inſtead of Air are filled with a ſubtile Matter, which I ſhall call Fire; now if you throw that immediately into Water the Fire will be expelled from the Pipes, and ſince there can be no Vacuum, the Water will immediately ſucceed therein, and then that ſame piece of Wood-coal muſt neceſſarily ſink to the bottom.

Now, that you may the better conceive the configuration of the ſo called *Dryſ*, or Pumice-ſtone, I have placed ſeveral very ſmall Particles thereof before a Microſcope, which if they had been bigger, it would have been impoſſible to obſerve their ſhape.

Tab. 1. Fig. 1. A. B. C. D. E. F. G. H. repreſents a ſmall Particle of the fore-mentioned Stone, in which you may perceive the very ſmall Tubes, tho by reaſon of their exceeding ſmallneſs thoſe Cavities can be ſeldom ſeen, ſome of the largeſt of them are deſcribed between G. and H. and the moſt of thoſe that are obvious to the Eye cannot however be eaſily delineated. I diſcovered moreover ſuch exceeding fine Veſſels, that ſeveral hundred of them are not equal to a ſingle Hair in the Wool of Sheep.

The Stone is of a wonderful and inconceivable figure; for as the Canals or Veſſels in Trees and Plants do almoſt all of them appear very regular, running ſome Perpendicular, others Horizontally, the Canals of this Stone run ſo ſtrangely, that one can hardly form any Idea thereof, eſpecially when one views the Particles of it as they lye in thoſe ſmall Cavities or thereabouts.

The Cavities that are without theſe little Pipes in the Stone are of ſeveral ſizes, and becauſe theſe Particles of the Stone that were ranked near the Cavities appeared very wonderful to me, I cauſed the Painter to deſcribe two of them as they ſtood before different Microſcopes.

Fig. 2. I. K. L. M. N. O. P. Q. repreſents a ſmall Particle of the ſaid Stone, of which Q. I. K. L. M. N. lay near a Cavity that was in the Stone; and wherein are deſcribed, as well as it is poſſible to do it, thoſe ſmall Pipes of which that part is compoſed.

Now as ſuch a Stone is continually growing, or to ſpeak more Philoſophically, the Juices are always carried up through thoſe Pipes, I ſuppoſe there happened ſome obſtructions in bringing thoſe Saps about L. M. by which means thoſe little Branches that are deſcribed by N. O. and P. Q. ſhot them out into the Cavity of the Stone.

I placed before another Microſcope a much ſmaller and thinner Particle of this Stone, as you may ſee in Fig. 3. S. T. U. W. X. Y. of which R. S. T. Y. lay near the Cavity that was in the Stone; and as is before ſaid, there happening ſome Obſtructions in the Pipes or Veſſels about S. T. U. by which the aſcending Juices were forced to alter their Courſe, it occaſioned an excreſcence, which bent or protruded itſelf into the Cavity of this Stone, as is deſcribed S. U. W. X. Y.

After theſe Obſervations I talked with the Man that ſells Colours, or the Materials for Dying, where this Stone is alſo to be bought; who told me that it was true that the Pumice-ſtone is found floating upon the Sea, but that there are no whole Rocks of thoſe Stones, and that Spunges grow upon them.

Now, if what he affirmed is true, I imagin that ſome common Salt, otherways call'd Sea Salt, would be found in ſome of the Pores of this Stone; to ſatisfy my ſelf therein, I took a piece of Stone about the bigneſs of the top of my Finger, and laid it upon ſome Wood-coal till it was glowing hot, and then threw it into clean Rain Water, imagining it would ſink to the bottom; but I was deceived in my expectation, for moſt of the Water had inſinuated itſelf into the Pores or Pipes of the Stone.

After this tryal I took the Particles of the Stone that was broke to pieces in the Water, and laid them upon a clean piece of Paper, and then put thoſe pieces into Water again, in order to impregnate it with the Salt Particles that were in the Stone; then I placed ſome of the Water upon four diſtinct Glaſs Plates, and when it was almoſt evaporated I could perceive a great number of Salt Particles, whoſe Baſis was an exact ſquare, all the four ſides of which aſcended Pyramidically, the Superficies of others, which could be but juſt perceived by the help of a good Microſcope, was a very ſmall ſquare, reſembling the Coagulations of our Common Salt; and as our common Salt in moiſt Weather becomes liquid, ſo alſo did theſe; but ſo ſoon as it was fair and dry Weather again, the Watry Parts exhal'd, and the Salts reſumed their former figure: I ſaw likewiſe amongſt them ſome Particles that were Common Salt.

Now, I don't doubt but that many of theſe Pumice-ſtones are found in the Sea; for having viewed ſeveral of them they did not appear to me to have any ſharp Angles, and amongſt the reſt there was one of an Oval figure and as big a Man's Fiſt, and when it was thrown into the Water in my preſence, I ſaw it float with the half of its Body above the Superfices of the Water; from whence I concluded, that by its long driving in the Water the Angles of ſuch a Stone were ſo worn off, that inſtead of having ſharp and uneven points, they were grown to be blunt and ſmooth.

And it may alſo ſo happen, that from the Rocks, whether they be in the Sea or upon the Shoars thereof, ſuch a ſoft Matter as theſe Stones ſeem to be compoſed of is torn or ſeparated by ſtormy Winds.

When I laid the ſame Stone upon the Fire, I could perceive a ſmoaky Matter evaporating from it.

This laſt mentioned Experiment induced me to take ſome of the little pieces of the Stone, in order to keep together, as much as it was poſſible, the Matter which was exhaled from them; and accordingly I did perceive that the firſt Matter which was driven off was as bright a Vapour as one ſhould ſee, but the next, which was forced out by a yet ſtronger Fire, was nothing near ſo bright, and was moreover laden with an unſpeakable number of exceeding ſmall Particles; which, by reaſon of their weight, ſunk to the bottom, after which that Vapour became clear: There was alſo drawn off from the ſame Stone a little Matter, which I look upon to be Sulphur.

I have indeed before now heard ſay, that the Spunges which are found in the Sea did grow upon the Rocks, which however I could hardly conceive, believing that the ſolid Rocks could not produce ſuch a ſort of Matter; but when I came to be informed that there are whole Rocks in the Sea compoſed of Pumice-ſtone, 'tis eaſy to imagine that they may produce ſuch a Matter as we call Spunge.

I have formerly had one of theſe Spunges, in which I found a little hardneſs, and from that hardneſs I do ſuppoſe the Spunge received its firſt growth.

Having opened that part of the Spunge, I took out of it a little Shell and ſome very ſmall Stones; the Shell was of a particular figure, and ſuch as is not to be found upon the Strands of our Sea.

Thereupon I went to ſome of thoſe Shops that ſell Spunges, and examining the ſeveral Spunges, I took divers little Shells, Horns and Stones out of 'em, and amongſt the reſt one Shell that was bigger than any of thoſe that I had ſeen before; from whence I concluded, that the ſtorms, by putting the Sea into an extraordinary motion in or about thoſe places where Spunges grow upon the Rocks, had raiſed from the Ground theſe little Shells and Stones and thrown them into the Spunges whilſt they were growing; the rather becauſe theſe little Shells and Stones were not only ſurrounded in ſuch a manner by the Spunges as to impreſs their own figures in them, but even the parts of the Spunges had inſinuated themſelves into the little Shells, inſomuch that they could not be ſeparated from thoſe Shells without breaking ſome of the parts of the Spunges.

Fig. 4. A. B. C. D. E. repreſents a little Shell or Scollope, which by the tearing it out of the Spunge was a little damaged, as you may perceive between C. and B; at A. there grew to it ſmall parts of red Coral, and upon C and D there lay much ſmaller Particles of the ſame; there was ſome Coral too on that ſide of the Shell that was turned from the ſight.

Between B and C we alſo diſcovered an Animalculum that is deſcribed like a Snake or an Eel; and I have obſerved the ſame, not only upon this Shell but alſo upon ſeveral little Stones that I have taken out of Spunges.

I had alſo a little piece of a Sea Shell, which we call a Horn, upon which, in 4 ſeveral places, there grew little Particles of red Coral.

This ſmall piece of a Sea Horn was grown over with a petrifyed Matter, in which Matter there was a great many ſmall Holes; and obſerving likewiſe ſeveral ſmall long Animalcula that were alſo ſurrounded with a Petrifyed Matter, and whoſe Figures exactly agreed with thoſe little Holes; I began to conſider whether, or no theſe Animalcula might not have belonged formerly to thoſe Sea Horns or Shells.

Fig. 5. F. G. H. Repreſents the ſaid Particle of the Sea Horn, upon which there grew ſeveral ſmall Particles of Coral between G and H.

I met likewiſe with 2 ſmall pieces of an Oſſifyed or Bony matter, which were hollow, and upon which likewiſe there grew a little Coral.

Now, That red Coral ſhould grow in the bottom of the Sea is impoſſible to be conceived, or that the Coral matter, which is found upon the forementioned Shells and Stones, can be ſaid to grow there, is what, with ſubmiſſion, we cannot allow of, but it ought rather to be called a Coagulation of ſuch kind of Matters; and who knows but that all the white and red Coral that is found in the Sea is produc'd by ſuch a Coagulation of Parts.

As for the Particles of the ſaid Coral, they are not compoſed of Branches, but they lay by, and upon one another like the great Sands that were joyned to each other; but when one looks upon them through the Microſcope, one can eaſily perceive that the parts of which they are compoſed were firmly united to each other, and that the Ground to which they were fixed was more broad than high.

I took this forementioned Scollop and Sea Horn, which was overſpread with Coral, out of a great Spunge, but tho I went into 2 other Shops that ſold Spunges, and e amined ſeveral of them, yet I could meet with no S that were covered with Coral.

Upon the abovementioned Obſervations, I conſider'd with my ſelf, whether the Pumice Stone was not to be found in the Mediterranean Sea.

Upon mentioning of Spunges, I cannot forbear telling you that I did not conſider them a great many years ago, and was much aſtoniſhed at the ſtrange Production of them, becauſe that in the growth of all Plants we may obſerve a ſprouting out, which in the beginning thereof we call a Stem or Stalk, from which Stalk Boughs or Branches are produced, by which their parts become greater and more extended; but in the growth of Spunges it happens quite otherwiſe; for they have no Stem as far as it appears to us, nor growing thicker and larger; for their beginning and ending is much of the ſame magnitude, and out of one of their firſt Productions another like Particle ſprouts out, and out of the ſecond ſeveral others, but all of them very ſhort.

To make you conceive the ſame, I have thought fit to deſcribe a ſmall Particle of Spunge as it appeared through a Microſcope, as you may ſee in Fig. 6. I K L M N O P, which I pared off of a Spunge, as thin and as ſmall as 'twas poſſible, where the parts of the Spunge are deſcrib'd, coming one out of the other, and then united together again; and though we cannot conceive how the Spunge grows bigger, yet we may ſee that this is the manner of its encreaſing.

For ſuppoſe that the parts broken off at K L or M N grow out ſo far that they come to touch one another and to joyn, new parts will grow out of them and uni themſelves again, as we may ſee in the diſſection of th ſmall Particle of Spunge, which is altogether forme ter this manner.

'Tis a common ſaying, That a Spunge will ſuck up a great deal of Water; but I am not of that opinion, but rather conceive that the Water by the Preſſure of the Air is forced up between the ſmall concatinated parts of which the Spunge conſiſts; for if you put a dry Spunge into Water, ſome part of it will preſently ſink, that is to ſay, the Water will flow into the ſmall Vacuities of thoſe parts that are always linked together; for ſuppoſing that the Water that is cover'd by the Spunge is not lyable to ſo great a Preſſure of the Air as that Water that is open to it, (becauſe the Air muſt loſe a great deal of its weight before it can paſs through the manifold Particles of the Spunge,) the parts of the Water lying round about the Spunge are conſequently expoſed to a greater Preſſure, and by that means forced up into the parts of the Spunge where the Reſiſtance is leſs.

Now that the Water which is moſt preſſed ſhould force up that that is leaſt, is what we daily find by experience; for if we caſt our Eyes upon a Glaſs that is filled with Wine or Water, we ſhall always ſee that the Water will riſe a little higher about the Edges than in the middle, becauſe the Air that preſſes upon the Circumference of the Water, meets with greater Reſiſtance than that which preſſes in the middle, as we have ſaid before.

But if any one has a mind to be better convinced of the laſt Propoſition, let him take a Glaſs Tube about the bigneſs of a Hens Quill or ſomething ſlenderer, and only put it into Water, and he will find that the Water in the Tube will riſe higher than the Surface of the Water without; the reaſon of which is, that the Preſſure of the Air upon the Water that is within the Tube, is not ſo ſtrong as the Preſſure upon the Water without.

For my farther ſatisfaction concerning Spunges, I took a ſmall piece of Spunge, and with my Scizzars cut it into 2 pieces, and put one of the pieces into Water, and after

a

a ſmall ſpace of Time (ſufficient for it to ſubſide to the bottom) I viewed both the dry piece and the wet with a Microſcope, and how nicely ſoever I obſerved them, I could not diſcover that the parts of the one were thicker than the parts of the other.

Moreover, I viewed again the parts of the Spunge as exactly as it was poſſible for me to do it, but I could never diſcover that there was the leaſt Concavity in the ſlender parts thereof, for if there were any Concavity in them, I conceive it would appear when I examined thoſe fine parts with my Microſcope: For my farther ſatisfaction, I prepared a Glaſs Tube that was ſlenderer than one of the Particles of the Spunge, and was withal hallow, and I placed the ſame before a Microſcope, having put a ſmall Drop of Water into one end of it, and then I viewed it again, at which time it appeared clearly to me (as I have ſeen ſeveral times before) how far the Water was come into the Tube, for where the Water is, there the Glaſs appears as a ſolid Body; whereas on the contrary, in a Glaſs that is hallow, the Concavity alone is only Tranſparent, but the ſides do not appear ſo Tranſparent.

After this I endeavoured to divide the exceeding ſlender parts of the Spunge lengthways, becauſe I do conclude that ſlender parts have no ſtrength unleſs they are compos'd of yet ſlenderer parts, which was very difficult for me to do, becauſe they are ſo ſtrictly united to each other; however I was ſufficiently convinced that the ſaid ſlender parts do conſiſt of yet much finer.

II. *Part of a Letter from Mr* Ralph Thoresby, *F. R. S. concerning a large Ball voided by Stool.*

IN my laſt I promiſed you an account of a Ball lately voided by Madam *C——ly*, after ſo ſevere Pains that her Life was in danger, but ſhe is not willing to have it cut, and the bulk of it is much ſhort of what I can now give you an an account of from another hand; but this may ſerve as a further inſtance of the danger of ſwallowing the Stones of Fruit, for immediately after, ſhe voided ſeveral Plumb Stones, tho ſhe had not of 12 months before, eaten any of that Fruit. Captain *Weſt*, who gave me the favour of a Viſit, told me, he had once ſeen 2 larger Stones voided by a Neighbour, than any of thoſe 3 formerly mentioned: He has ſince procur'd them for me, and the leſſer of them is ſomewhat larger than the biggeſt of the other, but the other is ſurprizingly great; the form of it is not much unlike the *Echinus* Shell or *Helmet* Stone, flat on one ſide and roundiſh on the other; 'tis above 6 inches one way, and 7 the other, in Circumference. Mr *H. Hodgkinſon* (who is, I preſume, the Doctor or Surgeon concerned) ſent this relation along with them, "That "they were taken from *William Coldell* of *Green*, *May* "the 10th, *Anno Dom.* 1693. They weighed 9 Ounces "when firſt evacuated, and were removed by Dyet Drink "with an Alkaly Powder, and a Magiſtral Stomach-"Plaiſter; that the Perſon dyed 7 years after, of one too "large to be evacuated; for upon the griping of it, be-"twixt the Hypocondrias and Share-Bone, it felt to be "as large as a Gooſe Egg.

III.

III. *Several Experiments on the Attrition of Bodies* in Vacuo. *Made before the* Royal Society *at* Greſham College, *by Mr* Fr. Hauksbee, *F. R. S.*

A Deſcription of the Machine for Giving a Swift Motion to Bodies in Vacuo, *without Admitting the External Air, repreſented in Tab.* II. *Fig.* 1.

A. A. Is a Ladder, ſuch as is generally us'd in Houſes.

B. B. Is a Bar of Iron which paſſes through the Middle of the upper Step, and is faſten'd to the Back-board of the Ladder by 2 Nutts and Screws thro both the Board and Iron.

C. C. The Jaws of the Iron Frame which holds the great Wheel. D. D. 23 inches Diameter within its Groove.

E. E. The Braſs Plate of the Air Pump on which the Recipient f. f. is placed.

g. g. The Spindle to which Bodies of different Magnitudes may be faſten'd, by a hole paſſing thro the Middle of them, ſufficient to receive the Spindle; and by means of the 2 Nutts h. h. a larger or a ſmaller Body may be ſcrew'd faſt between 'em.

i. i. Is a Braſs Plate turn'd true to the Grownd Edge of the Recipient on which it is plac'd, having a Braſs Box in the middle of it, which is full of Collars of Leather well oyl'd, thro which the Spindle paſſes: The hole of the Braſs being likewiſe juſt fit to receive it.

k. k. Two Pillars with Nutts to ſcrew down a piece of Board, which has an Iron faſten'd to it to receive the upper point of the Spindle, the lower one falling into a Braſs Socket, ſcrew'd to the middle of the Plate of the Air Pump.

l. l. The Supporters reaching from the upper Board of the Ladder to the Pillars, to prevent the Recipients being drawn from its place by the motion and tug of the Wheel-band.

m. m. The ſmall Wheel which the Band ſurrounds from the great one, and is 1 Inch and a half diameter.

n. n. The Winch which gives motion to the whole. The ſmall Wheel m. m. making about 15 Revolutions to one of the large Wheel D. D. ſo that a Body faſtned to the Spindle g. g. of the ſmall Wheel m. m. muſt be turn'd 15 times round to once of the great Wheel; and according as it ſhall exceed in Diameter the ſmall Wheel, ſo will the Velocity of the Motion of the Extreme parts be proportionably encreas'd.

o. o. Are two Screws which faſten the Ladder to the Floor.

Experiment I.

An Account of an Experiment made Novemb. 21. 1705. *at a Meeting of the Royal Society at* Greſham College, *ſhewing that Light is Producibile upon a ſwift Attrition of Amber on Woollen* in Vacuo.

Being prepar'd with the Machine before deſcrib'd, for giving a ſwift motion to Bodies *in Vacuo*, the Amber made uſe of in this Experiment was Beads, about the bigneſs of ſmall Nutmegs, and Threaded; by which means a piece of Wood was ſurrounded with them, which I had purpoſely caus'd to be Turn'd, with a Groove on the edge of it, to keep the Beads from being diſplac'd upon a ſmart

Attrition. Likewiſe between every Bead was ty'd over a String from Pin to Pin, which were ſo many pieces of ſmall Wire, drove thro the Wood for their better ſecurity and faſtneſs, the Beads appearing about half their Diameter beyond the Wood to which they were fixt. (as in *Fig*. 2.) In this manner it was put on the Spindle, and faſten'd there by the two Nutts, as before deſcrib'd. (See *Fig*. 3.) Then the Braſs Plate on which the Woollen was wrapt, being ſcrew'd to its place, (by means of the Socket, which receives the lower point of the Spindle) would then ſpring back, and embrace the Amber with a moderate force. (s in *Fig*. 3.) Thus prepar'd, and the Receiver plac'd over, with its upper Plate and Box for the Spindle to paſs through, the Pump was ſet on work, and in a very little time the Mercury in the Gage was elevated to about 29 inches and a half, which ſhew'd the Recipient to be well exhauſted of its Air. The Great Wheel being then turn'd, gave a very ſwift Attrition of the Amber on the Woollen, but no Light at firſt appear'd : Yet in a ſecond or two of time it became viſible enough ; which ſhews it requires ſome degrees of Heat to produce the *Phænomenon*. I could not obſerve that the Continuance or Encreaſe of the Motion, did contribute any thing to the Enhancement of the Light, after the firſt production of it : Nor would the Light thus produc'd, live on the Amber to continue a Circle, notwithſtanding the velocity of the Motion given ; but dy'd ſo ſoon as it had deſerted the Affricated Woollen. However, on the Woollen, (during the Motion,) where the Attrition of the Amber was made, the Light continu'd without Intermiſſion, and was diſcernible at three or four foot diſtance. What farther to be taken notice of in this Experiment was, That it highly Corroborates and Confirms thoſe made on the Production of Heat *in Vacuo* by Attrition : For the Amber was not only moderately heated, but appear'd to be burnt and crackt by the Intenſeneſs of it. And the Woollen againſt which it rubb'd, appear'd likewiſe not only diſcolour'd, but perfectly ſcorcht and burnt through: That altho the ſame Motion and the ſame Attrition was given the Amber in the Open Air, yet very little Light did enſue, in Compariſon to the Appearance of it *in Vacuo:* That the Travel or Velocity of the extreme parts of the Amber, was equal to ſomething more than one third of a mile in a minute: Suppoſing the large Wheel to make two Revolutions in a ſecond of time, whoſe Diameter is 23 Inches; the Diameter of the ſmall one mov'd by it, one Inch and a half; and the Diameter of the Wood and Amber on the ſame Spindle with the ſmall Wheel, four Inches and a half.

Experiment II.

Shewing the Neceſſity of the Air's Preſence (at leaſt ſome degree of it) in the Production of Fire, upon the Attrition of Flint and Steel.

HAving provided a Steel Ring about 4 Inches Diameter, its Thickneſs about one eighth of an Inch, which between two pieces of Wood of a leſs Diameter, I fixt on the Spindle with the Nutts, as mentioned in the foregoing Experiment; its edge verging beyond the extreme of the Wood that held it about half an Inch. The Braſs Plate, which I made uſe of for faſtning the Woollen for the Attrition of Amber, ſerv'd likewiſe to fix a piece of Flint: An edge or corner of which ſtood expos'd to the Steel, which Braſs Plate by its Spring would hold the Flint pretty ſtrongly to it, notwithſtanding ſome might be worn or chipt off by the Rapidity of the Motion given. In this manner it was Cover'd with a Receiver, and Braſs Plate and Box, as the former. But before any Air was exhauſted, the Great Wheel was mov'd, which gave motion to the ſmall one, and conſequently to the Included Steel;

which exhibited ſparks of Fire in a very plentiful manner. After ſome Air had been withdrawn, the Great Wheel was turned, as before, but the number of Sparks then produc'd did not only ſeem to be leſſen'd, but a ſenſible decay of their Luſtre and Vigour was manifeſt. And ſo at every ſtop that was made, to repeat the Experiment at greater Rarefactions, did the Sparks produc'd ſtill diminiſh in their Quantity and Light; till at laſt, when the Receiver was well exhauſted of Air, then altho a more violent Motion was given the Steel than before, yet not the leaſt Spark appear'd to be ſtruck from it: But a ſmall Continued Light was viſible on the edge of the Flint, that was rubb'd by the Steel. Upon the letting in a little Air, ſome Sparks upon the motion given, were diſcovered of a dull gloomy hue; but upon letting in a little more Air, I know not by what Accident, the whole quantity Inſinuated, and then upon the repetition of the Wheels motion, the Sparks appeared as numerous and as vivid as at firſt.

Experiment III.

Touching the Production of a Purple Light, upon the Attrition of Glaſs on Woollen in Vacuo. *Together with the Various* Phænomena *of the ſame Experiment at ſeveral Tryals. As likewiſe ſome other Experiments on the ſame ſubject.*

The manner of making the Attrition, and the uſes of the ſeveral *Apparatus*, being already at large deſcrib'd, I ſhall not need now to take farther notice of them. The Glaſs us'd in this Experiment was Globular, about 4 Inches Diameter, having a Paſſage thro the Middle of it to receive the Spindle, to which it was faſten'd with Corks and Screw. The Woollen againſt which it was to rub, was ſuch as is now commonly ſold for Gartering, the courſer ſort of which I purpoſely choſe for its harſhneſs, thinking it likely to improve the *Phænomenon*, beyond the Liſt of Cloath formerly us'd for the ſame purpoſe. This Woollen was wrapt about the Arms of the Braſs Spring, (deſcrib'd in former Experiments,) and being ſcrew'd down to its place, gently embrac'd the Glaſs Globe. Thus prepared, and the large Receiver put over all, the Pump was wrought, and in a little time had exhauſted the Air from the Receiver: Then the large Wheel being turn'd, gave 15 Revolutions to the Included Globe, to one of its own; in which ſwift motion, rubbing on the premention'd Woollen, a fine Purple Light enſu'd, the included *Apparatus* being diſtinguiſhable by it, and continu'd ſo during the Attrition. Upon letting in a little Air, both the Light and its Colour did diminiſh: And as the Air at ſeveral times was ſuffer'd to re-enter the Receiver, ſo the Light became manifeſtly more Pale, and leſs Vivid. And even when the Receiver was repleat with Air, a ſmall faint Light did diſcover itſelf upon the ſame Attrition given, as at firſt. What is farther obſervable in this Experiment was, That the Purple Light which appear'd, ſeem'd to be about the breadth of half an Inch, and about one in height, being viſible no where but on each Arm of the Braſs Spring, where the Glaſs in its motion rubb'd on the Woollen. That the Light remain'd ſteady without the leaſt Undulation, notwithſtanding the Motion of the Glaſs was conſiderably ſwift. This being all that occurr'd at that time, I now beg leave to give ſome Account of the Various *Phænomena* that has happen'd at divers Repetitions of the ſame Experiment.

The firſt time I made it, its ſucceſs was much the ſame as I have juſt now related: But when I came to repeat it twice or thrice, with the ſame Glaſs, no Purple Light appear'd, a pale one then ſucceeded in its room, nor all the means I uſed could recover it, till I took a new Glaſs, which after I had us'd for the ſame purpoſe two or three times, ſerv'd me as the former; nor could it be Reviv'd again without a new one. In this Experiment it was ſometimes obſervable, that the Glaſs, when taken out after a violent Attrition, would be ſo hot as not to be held in the naked hand without a ſenſible Offence. That the Woollen on which it rubb'd would not only appear diſcolour'd, but ſometimes perfectly burnt through. Sometimes upon making this Experiment, it has happen'd that a Light would be carried quite round the Glaſs Globe, thereby making a continued Circle of it, during its Motion, notwithſtanding it toucht the Woollen in no more parts than in the former Experiments. At other times, a perfect *Halo* would diſcover itſelf around the Stagnant Light; which ſeems to me to proceed from ſome few drops of Water, that will ſometimes Inſinuate by the Spindle through the Box on the upper Braſs Plate, where is always kept Water, to prevent the entrance of Air there. This Water deſcending the Spindle till it reacht ſome more extenſive part, would there, by the violence of the Motion given, be thrown all about the Receiver in ſmall drops, ſome of which were likely to fall on the Woollen, where being heated by the Motion of the premention'd Glaſs, evaporated, appearing as a *Halo* around the Light; for ſince I made a Contrivance, to prevent the Waters ſcattering, no ſuch Appearance has happen'd.

Sometimes I have obſerved the Light to break from the Agitated Glaſs, in as odd a form as Lightning: Particularly at a time when I us'd ſome Liſt of Cloath, that had been drencht in Spirit of Wine, which was faſten'd to one Arm of the Braſs Spring, on the other of which was ty'd ſome of the ſame Liſt, that had been ſteept in Water impregnated with Salt-petre; but both the pieces of Liſt were very well dry'd before I made uſe of them.

At another time I made uſe of two flat Shells of Oyſters well dry'd ; inſtead of the Woollen for the Attrition of the Glaſs, each Arm of the Braſs Spring had one fixt to it. Upon the uſual Motion given the Glaſs *in Vacuo*, a Light appear'd, reſembling a fierce flaming Spark, juſt upon the ſpot where the Glaſs and Shells toucht one upon another. The Light ſeem'd not to extend itſelf, but was comprehended in a ſmall Compaſs.

I try'd next what would enſue upon the Attrition of Woollen on the premention'd Shells *in Vacuo*. The ſucceſs was, that there was a Light produc'd, but appear'd very dim and gloomy, at beſt like a faint *Halo*.

After all theſe, I thought it not amiſs, to try in what degree the Woollen might contribute to the *Phænomena* of the foregoing Experiments. I took ſome of the Liſt formerly mentioned, and bound it about the edge of a Wooden Wheel I had caus'd to be Turn'd for that purpoſe ; the Wheel, with its Woollen edge, I faſten'd on the Spindle, as uſual, and upon the Braſs Spring was uſed the ſame Gartering, as in the firſt Experiment. Theſe being put together, as in all the others, and the Receiver exhauſted, the large Wheel was turn'd, and upon the Attrition of the Woollens, a ſmall glimmering Light did ſucceed ; but the Continuance of the Motion, gave no encouragement to hope for any increaſe of it. I expected to have found the Woollens at leaſt diſcolour'd, upon the Friction of them, which was ſometimes made more than moderate. On the contrary, not the leaſt Sign of any ſuch thing appear'd. The Light totally diſappear'd, upon the readmiſſion of leſs than a quarter of the Recipients natural Content of Air, altho the Attrition then made was as great as it had been at any time before. I cannot diſcover that the various Colours of Woollen (as yet that I have try'd) does any thing contribute to the Different Colours of Light, exhibited in any of theſe Experiments:

Experiment IV.

Touching the Production of a Conſiderable Light, upon the Attrition of Glaſs on Glaſs in Vacuo, *and in Common Air.*

For this Experiment I made uſe of a Globular Glaſs, about three Inches Diameter, fixt on the Spindle, (as in the laſt,) and to the two Arms of the Braſs Spring (taken notice of in the ſame) were ty'd two ſlips of thin Board; to each of which were firſt faſten'd two pieces of Glaſs Tube, by putting ſome ſmall Neal'd Wires through their Cavities, which Wires likewiſe paſſing through ſome holes of the Board made for that purpoſe, kept them tight in their places, (in form of *Fig.* 5.) In this Mode, being cover'd with a large Receiver, and fitted in all reſpects as uſual, the Pump was wrought; which in a little time had exhauſted the Air from it. Then upon turning the large Wheel, a ſwift Motion was given to the included Glaſs Globe, in which Motion, rubbing on the premention'd Tubes, a conſiderable Light was exhibited: The whole Included *Apparatus* became perfectly diſtinguiſhable by it, and would have been much more ſo, had not the Day-light prevented: It then being but very little after 5. P. M. a clear Horizon, and in an open Room, when the Experiment was made. The Colour of the Light produc'd reſembled Melted Glaſs, not only juſt on the parts where the friction was made, but ſeemingly likewiſe at the Extreams of the Tubes A. B. where the Globe in its motion toucht them not.

What farther Obſervable in this Experiment was, That upon ſuffering the Air to re-enter the Recipient at ſeveral times, at every of which, the Motion being given, as at firſt, no ſenſible Decay of Light, or Colour of it appear'd, excepting at laſt, when the Tubes by much rubbing became worn, and conſequently leſſen'd in their Spring; ſo the Light (in proportion to the abatement of their force on the Moving Body,) would be diminiſh'd; as I have often obſerv'd, when the Motion has been made for ſome ſmall time, only in *Vacuo*, or in Common Air. And had the Experiment been begun where it finiſh'd, the leſſer quantity of Light (from the premention'd Cauſe) would then have been exhibited *in Vacuo*. Hence it follows, That the Different Mediums did no ways contribute to the Augmentation or Diminution of the Light produc'd, but ſeems wholly to proceed from the weakening of the Spring, by the wear of the Bodies, which is begot by the violent Attrition of one upon the other in either medium. I do not find that the polliſh, or glaze, on the outſide of a Glaſs, adds any thing to the Light, having produc'd the ſame by a Glaſs much worn by often uſing.

I have repeated the ſame Experiment about noon in a clear day; the ſucceſs was, that the Light produc'd *in Vacuo* was then as ſenſible to ſight, as a piece of red hot Glaſs of the ſame bigneſs at the ſame time would have appear'd in the open Air. But notwithſtanding the Appearance is ſuch, it is no longer ſo than the Motion is continu'd. Hence it is to be obſerv'd, That altho it ſeems to be of the Colour of Red hot, or Melted, yet it is not; for were it really ſo, it muſt of Neceſſity ſome ſmall time outlive the Motion; which in the darkeſt Night I could (as yet) never diſcover.

Experiment V.

Touching the Production of Light upon the Attrition of Glaſs on Glaſs under Water.

This Experiment was nothing more than a Repetition of the laſt, ſaving only the Included *Appàratus* was entirely cover'd with Water: From the ſurface of which when the Air came to be withdrawn, and the great Wheel turn'd as uſual, 'twas eaſie to diſcover a pretty ſmart Light, upon the firſt motion of the Included Glaſs Globe on the Tubes, illuminating the whole body of the Liquid. The parts of the Tubes where the friction was made by the Globe were diſtinguiſhably Red; but ſoon leſſen'd in their Appearance, and in no long time extinguiſh'd. The Water (by the Continuance of the Motion) approaching nearer and nearer to the Colour of Whey; and at laſt became ſo thick, by the Grit or Powder produc'd by the Attrition of the Glaſſes, that the Light could then be but juſt diſcover'd thro the Body of it, and that not conſtantly, but like faint flaſhes at diſtances. This Experiment I have made, when it has ſucceeded to appear more Luminous than at this tryal. I have obſerv'd the Duſt (produc'd from the Glaſſes upon their Attrition) thro a good Microſcope, but could not learn by my greateſt attention that the parts were any ways melted; they appear'd of a long and ſlender figure.

IV. *Part of a Letter from Mr* Samuel Brady, *to Dr* William Cockburn, *F. R. S. giving an Account of a Puppy in the Womb that receiv'd no Nouriſhment by the Mouth.*

IN the Converſation we had about the Nouriſhment of the *Fœtus* in the Womb, wherein we ſeemed to agree it was perform'd by the Umbilical Veſſels only, without the aſſiſtance of the Mouth, I mention'd a Puppy at its full growth, which had never receiv'd any Nouriſhment this latter way. It was whelp'd *November* 1704. had no appearance of a Mouth at all, liv'd ſome time after it was parted from its Dam; pulling the Skin off its Head, which had not the leaſt paſſage through it: The Head was one ſolid Bone, without Sutures, ſomewhat Round, as a Mans Skull, with a little prominence in the fore-part, reſembling the *Os Naſi* of a Man, but without any paſſage: It had no place for Eyes, nor *Meatus* for Ears, only the Outward Reſemblance of one on each ſide, unpenetrated and plac'd lower than naturally: No Jaw-bone, nor Conveyance to the top of the *Larynx* and *Pharynx*, but thence downward natural. I ſend you its Skin, ſtuff'd careleſsly for my own private ſatisfaction; for which you may ſee it was only deſign'd, by the little care taken in its preſervation from the Mice, and the loſs of the Bones: However, enough of it remains to ſhew that it receiv'd no Nouriſhment by the Mouth.

V. *A Relation of an extraordinary ſleepy Perſon, at* Tinsbury, *near* Bath. *By Dr* William Oliver, *F. R. S.*

May the 13th, *Anno* 1694, one *Samuel Chilton*, of *Tinsbury* near *Bath*, a Labourer, about 25 years of age, of a robuſt habit of Body, not fat, but fleſhy, and a dark brown Hair, happen'd, without any viſible cauſe, or evident ſign, to fall into a very profound Sleep, out of which no Art uſed by thoſe that were near him, cou'd rouze him, till after a months time; then roſe of himſelf, put on his Cloaths, and went about his buſineſs of Husbandry as uſual; ſlept, cou'd eat and drink as before, but ſpake not one word till about a month after. All the time he ſlept Victuals ſtood by him; his Mother fearing he wou'd be ſtarv'd, in that ſullen humour, as ſhe thought it, put Bread and Cheeſe and Small Beer before him, which was ſpent every day, and ſuppoſed by him, tho no one ever ſaw him eat or drink all that time.

From this time he remain'd free of any drowſineſs or ſleepineſs till about the 9th of *April* 1696, and then fell into his Sleeping fit again juſt as he did before. After ſome days they were prevail'd with to try what effect Medicines might have on him, and accordingly one Mr *Gibs*, a very able Apothecary of *Bath*, went to him, Bled, Bliſter'd, Cupp'd and Scarrified him, and uſed all the external irritating Medicines he could think on, but all to no purpoſe, nothing of all theſe making any manner of impreſſion on him; and after the firſt fortnight he was never obſerv'd to open his Eyes. Victuals ſtood by him as before, which he eat of now and then, but no body ever ſaw him Eat or Evacuate, tho he did both very regularly, as he had occaſion; and ſometimes they have found him faſt aſleep with the Pot in his Hand in Bed, and ſometimes with his Mouth full of Meat. In this manner he lay for about ten weeks, and then could eat nothing at all, for his Jaws ſeem'd to be ſet, and his Teeth clincht ſo cloſe, that with all the Art they had with their Inſtruments they cou'd not open his Mouth, to put any thing into it to ſupport him. At laſt, obſerving a hole made in his Teeth, by holding his Pipe in his Mouth, as moſt great Smoakers uſually have, they through a Quill pour'd ſome Tent into his Throat now and then: And this was all he took for ſix weeks and four days, and of that not above three pints or two quarts, ſome of which was ſpilt too; he had made water but once, and never had a ſtool all that time.

Auguſt the 7th, which is ſeventeen weeks from the 9th of *April*, (when he began to ſleep,) he awaked, put on his Cloaths, and walkt about the Room, not knowing he had ſlept above a night, nor cou'd he be perſwaded he had lain ſo long, till going out into the Fields he found every body buſy in getting in their Harveſt, and he remember'd very well, when he fell aſleep they were ſowing of Barley and Oats, which he then ſaw ripe and fit to be cut down.

There was one thing obſervable, That tho his Fleſh was ſomewhat waſted with ſo long lying in Bed, and faſting for above ſix weeks, yet a worthy Gentleman his Neighbour aſſured me, when he ſaw him, which was the firſt day of his coming abroad, he lookt brisker than ever he ſaw him in his life before; and asking him whether the Bed had not made him ſore, he aſſured him and every body, that he neither found that, nor any other inconveniency at all; and that he had not the leaſt remembrance of any thing that paſt or was done to him all that while. So he fell again to his Husbandry as he uſed to do, and remain'd well from that time till *Auguſt* the 17th, *Anno* 1697, when in the morning he complain'd of a ſhivering and coldneſs in his Back, vomited once or twice, and that ſame day fell into his Sleeping fit again.

Being then at the *Bath*, and hearing of it, I took Horſe on the 23d, to inform my ſelf of a matter of fact I thought ſo ſtrange. When I came to the Houſe, I was by the Neighbours (for there was no body at home at that time beſides this ſick man,) brought to his Bed ſide, where I found him aſleep, as I had been told before, with a Cup of Beer and a piece of Bread and Cheeſe upon a Stool by his Bed within his reach: I took him by the Hand, felt his Pulſe, which was at that time very regular; I put my Hand on his Breaſt, and found his Heart beat very regular too, and his breathing was eaſie and free; and all the fault I found was, that I thought his Pulſe beat a little too ſtrong: He was in a breathing Sweat, and had an agreeable warmth all over his Body. I then put my Mouth to his Ear, and as loud as I cou'd called him by his Name ſeveral times, pull'd him by the Shoulders, pincht his Noſe, ſtopt his Mouth and Noſe together, as long as I durſt, for fear of Choaking him, but all to no purpoſe, for in all this time he gave me not the leaſt ſignal of his being ſenſible. I lifted up his Eye-lids, and found his Eye-balls drawn up under his Eye-brows, and fixt without any motion at all. Being baffled with all theſe tryals, I was reſolv'd to ſee what effects *Spirit* of *Sal Armoniac* would have, which I had brought with me, to diſcover the Cheat, if it had been one; ſo I held my Viol under one Noſtril a conſiderable time, which being drawn from Quick-lime, was a very piercing Spirit, and ſo ſtrong I could not bear it under my own Noſe a moment without making my Eyes water; but he felt it not at all. Then I threw it at ſeveral times up that ſame Noſtril, it made his Noſe run and gleet, and his Eye-lids ſhiver and tremble a very little, and this was all the effect I found, tho I pour'd up into one Noſtril about a half ounce Bottle of this fiery Spirit, which was as ſtrong almoſt as Fire itſelf. Finding no ſucceſs with this neither, I cramm'd that Noſtril with Powder of *White Hellebore*, which I had by me, in order to make my farther trials, and I can hardly think any Impoſtor cou'd ever be inſenſible of what I did. I tarried ſome time afterwards in the Room to ſee what effects all together might have upon him; but he never gave any token that he felt what I had done, nor diſcover'd any manner of uneaſineſs, by moving or ſtirring any one part of his Body, that I could obſerve. Having made theſe my Experiments I left him, being pretty well ſatisfied he was really aſleep, and no ſullen Counterfeit, as ſome people thought him.

Upon my return to *Bath*, and relating what I had obſerv'd, and what proofs this Fellow had given me of his Sleeping, a great many Gentlemen went out to ſee him, as I had done, to ſatisfie their Curioſity in a Rarity of that Nature, who found him in the ſame condition I had left him in the day before; only his Noſe was inflamed and ſwelled very much, and his Lips and the inſide of his Right Noſtril bliſter'd and ſcabby, with my *Spirit* and *Hellebore*, which I had plentifully dos'd him with the day before: His Mother upon this for ſome time after wou'd ſuffer no body to come near him, for fear of more Experiments upon her Son. About ten days after I had been with him, Mr *Woolmer*, an Experienc'd Apothecary at *Bath*, called at the Houſe, being near *Tinsbury*, went up into the Room, finding his Pulſe pretty high, as I had done, takes out his Launcet, lets him Blood about fourteen ounces in the Arm, tyes his Arm up again, no body being in the Houſe, and leaves him as he found him;

and he aſſured me he never made the leaſt motion in the world when he prickt him, nor all the while his Arm was bleeding.

Several other Experiments were made by thoſe that went to ſee him every day from the *Bath*, but all to no purpoſe, as they told me on their return: I ſaw him my ſelf again the latter end of *September*, and found him juſt in the ſame poſture, lying in his Bed, but remov'd from the Houſe where he was before about a furlong or more; and they told me, when they remov'd him, by accident, carrying him down Stairs which were ſomewhat narrow, they ſtruck his Head againſt a Stone, and gave him a ſevere knock, which broke his Head, but he never mov'd any more at it than a dead man wou'd. I found now his Pulſe was not quite ſo ſtrong, nor had he any Sweats, as when I ſaw him before. I try'd him again the ſecond time, by ſtopping his Noſe and Mouth, but to no purpoſe; and a Gentleman then with me ran a large Pin into his Arm to the very Bone, but he gave us no manner of tokens of his being ſenſible of any thing we did to him. In all this time they aſſured me no body had ſeen him either eat or drink, tho they endeavour'd it all they could, but it always ſtood by him, and they obſerv'd ſometimes once a day, ſometimes once in two days all was gone. 'Tis farther obſervable, he never foul'd his Bed, but did his neceſſary occaſions always in the Pot.

In this manner he lay till the 19th of *November*, when his Mother hearing him make a noiſe, ran immediately up to him, and found him Eating; ſhe askt him how he did? He ſaid, Very well, thank God: She askt him again, Which he lik'd beſt, Bread and Butter, or Bread and Cheeſe? He anſwer'd, Bread and Cheeſe: Upon this, the poor Woman overjoy'd left him to acquaint his Brother with it, and they came ſtrait up into the Chamber to diſcourſe him, but found him as faſt aſleep again as ever, and all the Art they had cou'd not wake him. From this time to the end of *January* or the beginning of *February*, (for I cou'd not learn from any body the very day) he ſlept not ſo profoundly as before, for when they call'd him by his name he ſeemed to hear them, and be ſomewhat ſenſible, tho he could not make them any anſwer. His Eyes were not now ſhut ſo cloſe, and he had frequently great tremblings of his Eyelids, upon which they expected every day when he would wake, which happened not till about the time juſt now mention'd, and then he wak'd perfectly well, not remembring any thing that happened all this while. 'Twas obſerv'd he was very little altered in his Fleſh, only complained the Cold pincht him more than uſually, and ſo preſently fell to Husbandry as at other times.

I have no reaſon to ſuſpect this to be any Cheat, becauſe I never heard of any gain to the Family by it, tho ſo near the *Bath*, and ſo many People went thither out of Curioſity to ſee the Sleeper, who when awake was a ſupport to his old Mother by his Labour, but now a certain charge to her. Beſides there was ſeldom any body in the Houſe to attend any profit might be made by it, he being left alone in the Houſe, and every body at liberty to go up to his Bed-ſide.

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